# instructions for

# Q-100
## Noise Dosimeter

**Note:** Due to the new ATEX Directive in Europe, all references in this document to "Ex" or "EEx" for intrinsic safety approvals should be disregarded effective 7/1/03 within the member countries of the European Union (EU). At this time, this product is not approved in accordance with the new ATEX Directive and is not sold for use in hazardous atmospheres or explosive zones by customers within the EU. Outside of the EU, all references to intrinsic safety continue without change.

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Glossary

APPENDIX B
Q100 Dosimeter Setup Software

INTRODUCTION

The Q-100 accumulates, calculates, and displays noise measurement data.

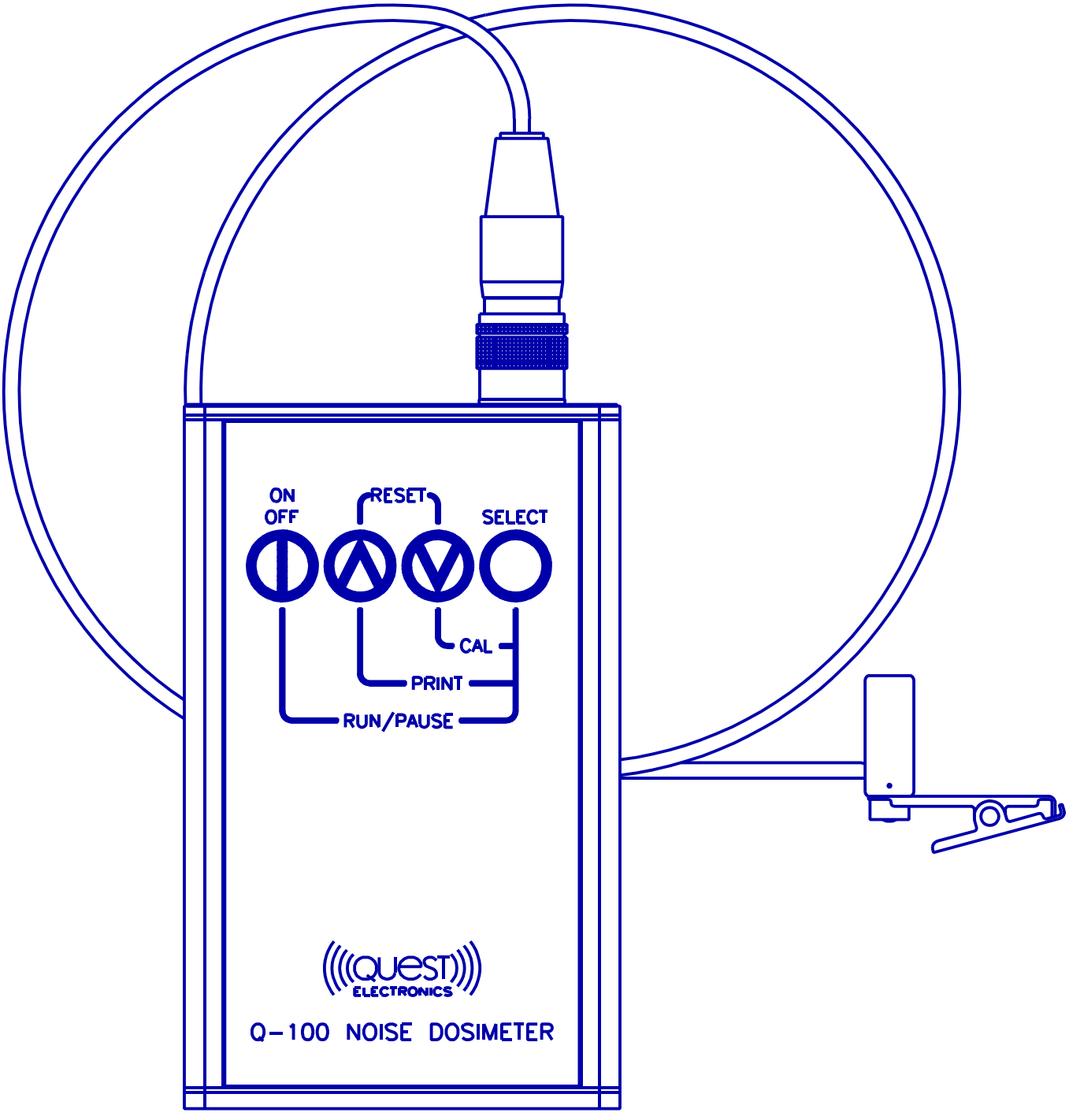


**Figure 1.** Q-100 Noise Dosimeter.

The Q-100 can function as two simultaneous noise dosimeters (d1 and d2) operating with different thresholds.

The Q-100 functions as either a personal noise dosimeter, an environmental monitor or a survey event monitor.

- When used as a Personal Noise Dosimeter:

  The Q-100 may be clipped on a belt or worn in a shirt pocket. The small microphone is simply clipped to the shirt or shirt collar near the ear.

- When used as an Environmental Monitor or Events Monitor:

  The Q-100 may be either hand held or mounted to a standard camera tripod. The microphone is connected to the "Microphone Boom" and the unit is held as you would a sound level meter.

- When used with a Printer:

  The Q-100 can print detailed reports of noise events. It connects to a printer by using a Quest "Parallel Printer Interface" or "Serial Computer Interface".

The Q100 DOSIMETER Setup Software allows the user to program the Q-100 from a personal computer.

## BATTERY INSTALLATION

The battery must be a 9 Volt Alkaline type.
(Examples are: NEDA 1604A, IEC 6LF22, or IEC 6LR61)

- Insert the battery into the battery compartment as follows:

  1.) Position the Q-100 so that the belt clip (back of the Q-100) is facing upwards.

  2.) The battery cover is fastened to the end of the Q-100 with a single captive Phillips screw. Use a screwdriver to loosen the screw. Remove the battery cover.

  3.) View the battery terminal drawing on the back of the Q-100. Slide the battery into the battery compartment as the drawing indicates.

  4.) Install the battery cover as follows:

  A.) Use the screwdriver to start the screw into the threaded opening in the Q-100.

  B.) As you tighten it, be sure that the two short posts on the inside of the cover align with the body of the Q-100.

CABLE REMOVAL OR ATTACHMENT

The Q-100 uses a single connector for attaching the microphone or the serial or parallel data interface modules. Remove or attach the Cable Connector as follows:

- To remove the Cable Connector from the Q-100:
  - Gently grasp and pull the knurled ring of the cable connector.
- To attach the Cable Connector to the Q-100:

1.) Grasp the black rubber boot of the cable connector.

2.) Gently press the cable connector against the Q-100 connector while slowly rotating it. When it is properly lined up, it will stop rotating and slide into the dosimeter.

3.) Push the connector into the dosimeter until a "click" is heard. The cable connector is now attached.

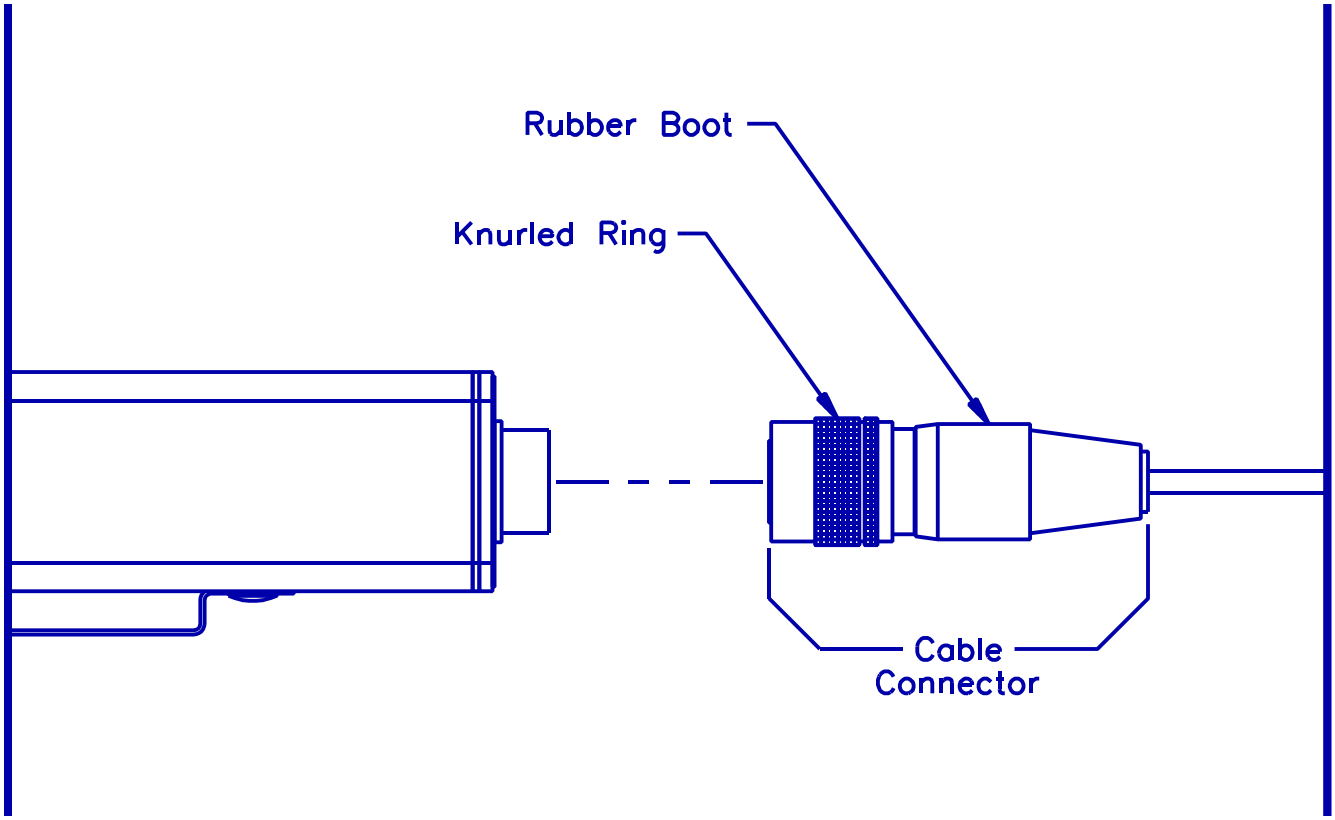


**Figure 2.** Q-100 Cable Connection.

## USING THE MICROPHONE BOOM

To make the Q-100 easier to use when either hand-held or tripod mounted, the microphone can be mounted on the microphone boom.

The microphone boom attaches to the back of the Q-100 as follows:

1.) Connect the microphone to the microphone boom in one of the following ways:

- Clip the microphone to the microphone boom.
- Unscrew the microphone clip from the microphone and screw the microphone boom to the microphone.

2.) Carefully wind the cable onto the upper portion of the microphone boom.

3.) Insert the microphone boom pin into the center hole on the belt clip.

4.) Fasten the bottom of the microphone boom to the belt clip with the microphone boom thumbscrew.

The exposed end of the microphone boom thumbscrew is threaded so that it can be mounted to a tripod.

## UP AND RUNNING

### Turning the Q-100 On:

- Press and hold the ON/OFF Key for 1 second until the display lights. The display will briefly show the current software revision "r2.xx", and then count down from "InI9" to "InI1". The Q-100 is now "initialized" (warmed-up) and ready to use.

### Resetting the Q-100:

- To clear stored data from memory, simultaneously press and hold the two keys representing RESET. The display will indicate "rES5". It will count down to "rES1" and the Q-100 is now reset.

### Turning the Q-100 Off:

- Press and hold the ON/OFF Key. The display will read "OFF5", count down to "OFF1" and then turn off.

### Starting and Stopping Data Collection:

- Simultaneously press the two keys representing RUN/PAUSE. Each time that this is done, data collection, or logging, will alternately start and stop. "RUN" will appear while logging.

DISPLAYED DATA AND OPERATION

The display contains a central 4-character numeric section which is surrounded by various display indicators, some of which show which measurement is being displayed.

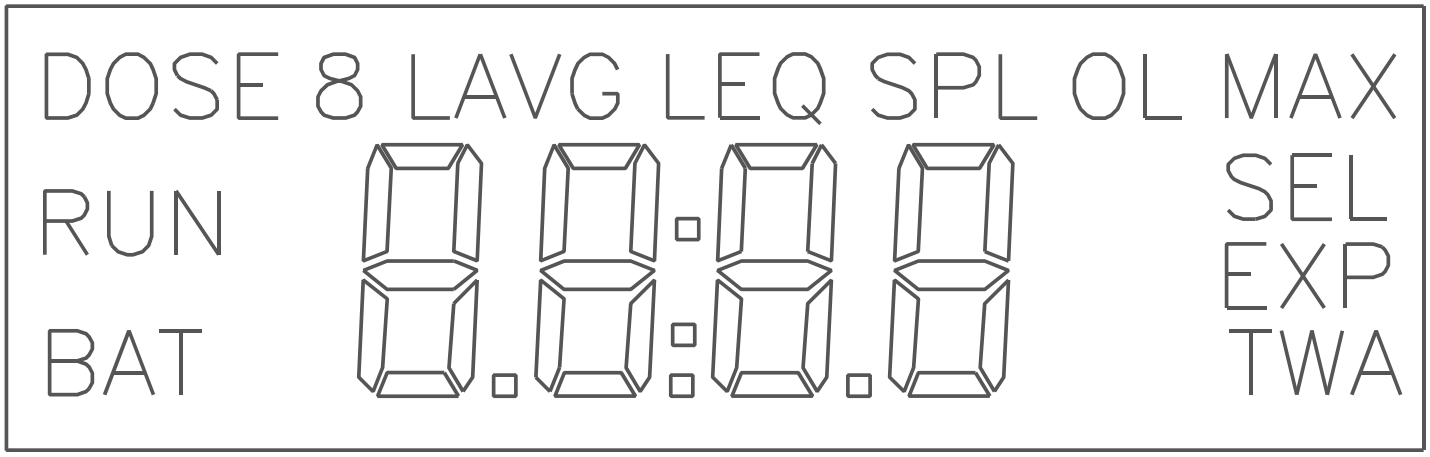


**Figure 3.** Q-100 Display.

To select the information displayed:

- Press the UP or DOWN ARROW Key. The display indicators and will change in a rotating manner.

Dosimeter 1 and 2 information is selected as follows:

- Each time that the SELECT key is briefly pressed, the data for the displayed function will alternate between Dosimeter 1 and Dosimeter 2 as follows:
  - The Display will first indicate which dosimeter information will be displayed ("d1.xx" or "d2.xx"). The last two digits (xx) indicate the Threshold. It will appear for a brief period and then will be followed by the data.

    Example: If Dosimeter 1 data is to be shown and its Threshold is 90 dB, "d1.90" will be displayed.
  - If the threshold for both dosimeters is set to the same value, the display for the second dosimeter will instead show data for the current event. The display will be preceeded by "E xx" where xx is the event number. Each time the dosimeter is placed into RUN, a new event is started.

The displayed value can be made to continuously update as follows:

- Press and hold the SELECT Key for at least 3 seconds. The display will now update every second.
- To remove the Q-100 from this mode, briefly press the SELECT Key. The display will stop updating.

The Data Functions (available for Dosimeters 1 and 2) are:

"DOSE" Dose
"DOSE 8" 8 Hour Projected Dose

"LAVG" Average Level with a 4, 5 or 6dB Exchange Rate
"LEQ" Average Level with a 3 dB Exchange Rate

"SPL" Sound Pressure Level

"MAX" Maximum Level, weighted, with F or S time constant

"SEL" Sound Exposure Level (3, 4, 5, 6 dB Exchange Rate)

"EXP" Exposure (3 dB Exchange Rate only)

"TWA" Time Weighted Average

NOTE: See "APPENDIX A, Acoustical Definitions" for more detail about these functions.

The Security Feature, Run Time, Battery Indicator and Run appear as follows:

"SEC" Security Mode is ready to activate.

- Only displayed if security mode has been activated by the Q100 DOSIMETER Setup software.

"xx:xx" Total Run Time in Minutes : Seconds.
"Hr:xx" Total Run Time in Hours (if less than 100).
"Hx:xx" Total Run Time in Hours (if from 100 to 1000).
"xx:xx" Total Run Time in Hours (if more than 1000).

- "xx:xx" displayed if less than one hour of data has been logged.
- "Hr:xx" only displayed if more than one hour of data has been logged.
  - Use the SELECT Key to alternate between Hours and Minutes/Seconds.

"BAT" Automatically appears when the battery is low.

- After first appearing, the battery is good for at least 8 more hours of operation.

"RUN" Indicates that data logging is occurring.

## Overload Indication - OL

If the sound pressure level exceeds the range of the instrument, "OL" will appear in the display, indicating an overload has occurred. If this happens while in RUN, OL will remain in the display until the Q100 is reset. To view data after an OL occurs, press and hold the SELECT key. (NOTE: newer model Q-100s have a separate OL indicator in the display, so that OL and data may be viewed simultaneously.) OL conditions will appear on the printout as peaks of 113dB or greater on the low range, or 143dB or greater on the high range.

## RECORDING EVENTS

The Q-100 will store up to 999 events. An Event will be stored each time that it is Run and Paused.

It is up to the operator to keep track of the location of each event as it is recorded.

Operate the Event Mode as follows:

- Reset the Q-100. This clears all stored data.
- Run and Pause the Q-100 for each Event. If the thresholds for dosimeters 1 and 2 are the same, the current event data will be viewed instead of dosimeter 2.
- Accumulate as many Events as desired.
- Print directly from the Q-100 or use the Noise Manager software with a computer to review and/or print the data.

## PRINTER USE

### Printer Connection:

The Q-100 can send data directly to a printer or personal computer. One of the following INTERFACE Modules is required:

- PARALLEL PRINTER INTERFACE (Stk. # 056-957)

  Converts the data to Parallel Printer compatability.

- SERIAL COMMUNICATIONS INTERFACE (Stk. # 056-956 or 056-707)

  Converts the data to RS-232 output for Serial Printer operation or downloading to a personal computer.

To connect the Q-100 to a printer:

1.) Remove the microphone cable from the Q-100 as follows:

   A.) Grasp the knurled microphone cable connector and gently pull to remove the microphone cable.

2.) Connect the PARALLEL PRINTER INTERFACE round cable connector to the Q-100 as follows:

A.) Grasp the black rubber boot of the cable connector.

B.) Gently press the connector against the Q-100 connector while slowly rotating it. When it is properly lined up, it will stop rotating and slide into the dosimeter.

C.) Push the connector into the dosimeter until a "click" is heard. The cable is now connected.

3.) Insert the other cable connector (attached to the flat cable) into the printer.

When using a parallel printer there should be no additional setup required.

If a serial printer is used, it's data parameters must match that of the Q100 as follows:

9600 baud
1 Start bit
8 Data bits
1 Stop bit
No parity (disabled)

## Preparing to Print

Use the Q-100 with a Printer as follows:

1.) Accumulate data with the Q-100.

2.) Place it in the Pause mode.

3.) Remove the microphone from the Q-100 and connect the printer and appropriate Interface Module.

4.) Turn on the printer and the Q-100.

5.) Press the key combination for PRINT. **"Prn"** followed by **"PAr"** or **SEr"** will appear in the display. The printer will begin to print data as described in the next section, SAMPLE PRINTOUT.

To abort a printout:

- Press any key. **"PAr"** or **SEr"** will disappear from the display. The print function will halt.

  NOTE: The printer may continue to print for several seconds after being aborted. If this is not desired, shorten the length of the printer buffer (if possible). Consult the printer manual.

- If you abort a printout, data stored in the Q-100 is not destroyed. Simply print again.

SAMPLE PRINTOUT

The following figures illustrate each section of the Printout.

Header Section Figure 4

The Header states the following:

- The Model Number: (Q-100 Noise Logging Dosimeter)
- The Unit Software Rev Level: (Unit Version Number: X.XX)
- "Noise Manager" Software Rev Level: (Appears if used.)
- The Serial Number: ( 2 Letters followed by 7 Digits)

The Header provides locations to write in the following data:

- Name
- Work Area
- Comments

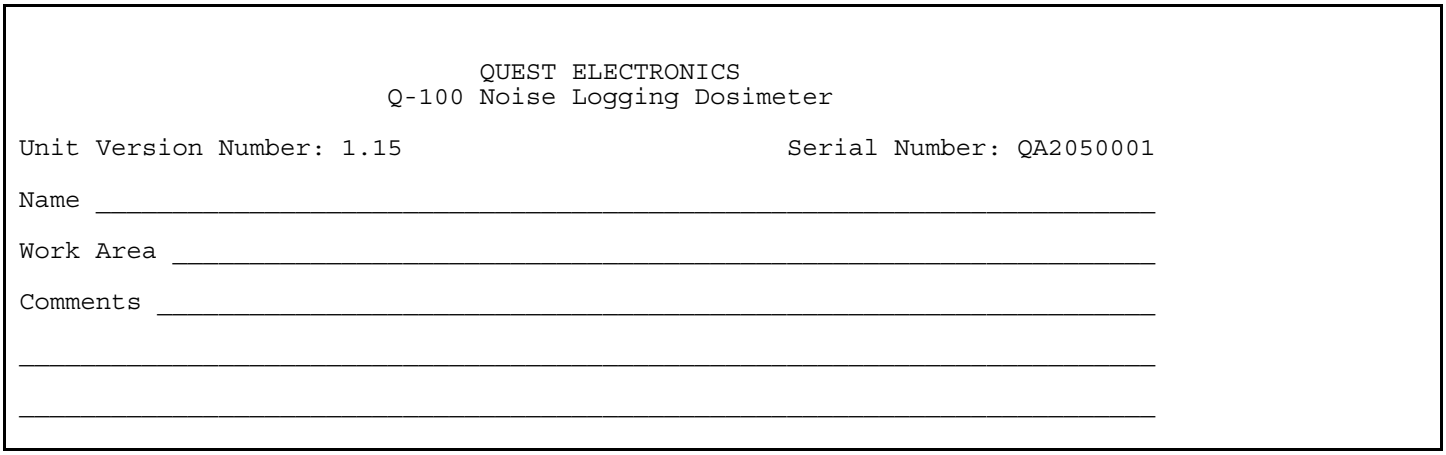


**Figure 4.** Header Printout.

Calibration Section Figure 5

The Calibration is printed out as follows:

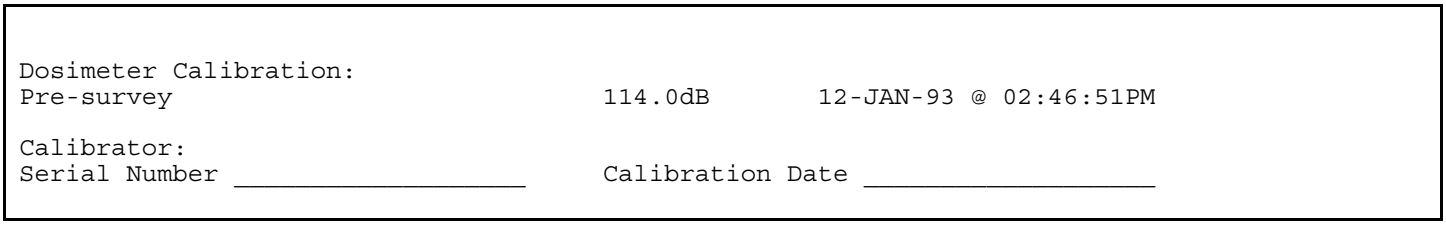


**Figure 5.** Calibration Printout.

Parameters Section Figure 6

The Parameters for Dosimeter 1 and Dosimeter 2 are printed out as follows:

```
Auto Settings:
Auto-On Disabled Mode - Daily  Time 12:00:00PM Duration 00:01 H:M

Dosimeter 1 Parameters:
Range      70-140dB       Weighting         A       Time Constant  Slow
Criterion      90dB       Threshold      80dB       Exchange Rate   5dB
Prj Period    8.00H       Upper Limit   115dB

Dosimeter 2 Parameters:
Range      70-140dB       Weighting         A       Time Constant  Slow
Criterion      90dB       Threshold      90dB       Exchange Rate   5dB
Prj Period    8.00H       Upper Limit   115dB
```

**Figure 6.** Setup Printout.

Time Summary / Data Summary Section Figure 7

The Summary Printout (Time Summary / Data Summary) is printed out as follows:

```
Time Summary:
Number of Events     1
Event Started              Event Stopped
12-JAN-93 @ 02:55:10PM     12-JAN-93 @ 03:01:00PM     Event      1

Total Run       0:05:49    Total Pause      0:17:13

Data Summary [Dosimeter 1, A / Slow, Threshold  80dB, Exchange Rate 5dB]
Peak Level  108.8dB        12-JAN-93 @ 02:56:00PM
Max Level    98.4dB        12-JAN-93 @ 02:56:45PM
Min Level    58.3dB        12-JAN-93 @ 03:00:58PM
UL Time         0:00:00
Lavg         79.7dB        Dose           0.29%       SEL(5)       121.9dB
TWA          47.9dB        Dose[8]       23.93%
TWA[ 8.00]   79.7dB        Dose[ 8.00]   23.93%

Data Summary [Dosimeter 2, A / Slow, Threshold  90dB, Exchange Rate 5dB]
Peak Level  108.8dB        12-JAN-93 @ 02:56:00PM
Max Level    98.4dB        12-JAN-93 @ 02:56:45PM
Min Level    58.3dB        12-JAN-93 @ 03:00:58PM
UL Time         0:00:00
Lavg         71.5dB        Dose           0.09%       SEL(5)       113.8dB
TWA          39.7dB        Dose[8]        7.42%
TWA[ 8.00]   71.5dB        Dose[ 8.00]    7.42%
```

**Figure 7.** Time Summary / Data Summary Printout.

Event Summary Section Figure 8

Each time that the Q-100 is Run and Paused, an event is stored in memory. When printing, an Event Summary Printout will automatically occur as follows:

Each Event Summary is computed for the Run Time of each event.

Event Summaries are printed as follows:

```
Event     1

Name _____________________________________________________________________

Work Area ________________________________________________________________

Comments _________________________________________________________________

_____________________________________________________________________

_____________________________________________________________________

Event Started              Event Stopped
12-JAN-93 @ 02:55:10PM     12-JAN-93 @ 03:01:00PM

Run Time         0:05:49

Data Summary [Dosimeter 1, A / Slow, Threshold  80dB, Exchange Rate 5dB]
Peak Level  108.8dB        12-JAN-93 @ 02:56:00PM
Max Level    98.4dB        12-JAN-93 @ 02:56:45PM
Min Level    58.3dB        12-JAN-93 @ 03:00:58PM
Lavg         79.7dB        Dose          0.29%       SEL(5)      121.9dB
TWA          47.9dB        Dose[8]      23.93%
TWA[ 8.00]   79.7dB        Dose[ 8.00]  23.93%

Data Summary [Dosimeter 2, A / Slow, Threshold  90dB, Exchange Rate 5dB]
Peak Level  108.8dB        12-JAN-93 @ 02:56:00PM
Max Level    98.4dB        12-JAN-93 @ 02:56:45PM
Min Level    58.3dB        12-JAN-93 @ 03:00:58PM
Lavg         71.5dB        Dose          0.09%       SEL(5)      113.8dB
TWA          39.7dB        Dose[8]       7.42%
TWA[ 8.00]   71.5dB        Dose[ 8.00]   7.42%
```

**Figure 8.** Event Summary Printout.

Time History Section Figure 9

The Q100 DOSIMETER Setup Software allows you to determine which information is to be logged for printing at a later time. Each Dosimeter will produce Time Histories based on the selection of the following:

- "Log Avg" Average Time History will print for either Dosimeter 1, dosimeter 2, or both (depending on how the Q-100 was set up).
- "Log Max" Maximum Level Time History will print. Note that both Dosimeter 1 and Dosimeter 2 will always have the same Max Levels. Therefore, only one printout will appear.
- "Log Peak" Peak Level Time History will print. Note that both Dosimeter 1 and Dosimeter 2 will always have the same Peak Levels. Therefore, only one printout will appear.

The Logging Interval (Time per Sample) is entered with the Q100 DOSIMETER Setup Software to be one of the following:

- "1 second" 1 Second / Sample
- "10 seconds" 10 Seconds / Sample
- "1 minute" 1 Minute / Sample

Time Histories can be printed in either a Tabular or Graphical Format based on the selection you make with the Q100 DOSIMETER Setup Software. The length (and resolution) of the printout can be changed with the Setup Software by selecting Samples / Line and changing the number from 1 to 120.

Time per Line appears on the printout and is defined as follows:

- When printing Tabular information, it is the time between each value as it is printed moving left to right.
- When printing Graphical information, it is the time between each line of type.

Calculate the Time per Line as follows:

- The dosimeter logs information as Time per Sample.

  (1 Sec / Sample) (10 Sec / Sample) (1 Min / Sample)

- The Printout is programmed as Samples per Line:

  (Samples / Line) (1 to 120)

- Multiply the "Time per Sample" by the "Samples per Line" to get the "Time per Line".

EXAMPLE:
(1 Minute / Sample) X (10 Samples / Line) = 10 Minutes / Line
A Time History Printout will appear as follows:

**TABULAR FORMAT**

```
Lavg TIME HISTORY [Dosimeter 1]                                  Page    1
Weighting     A   Time Constant Slow
Threshold  80dB   Exchange Rate  5dB

1    (Sec)
12-JAN-93
Time           Lavg
02:55:10PM   87.6dB   84.6dB   84.7dB   88.0dB   89.0dB
02:55:15PM   88.4dB   85.5dB   83.7dB   87.1dB   87.9dB

Max TIME HISTORY                                                 Page    1
Weighting     A   Time Constant Slow

1    (Sec)
12-JAN-93
Time            Max
02:55:10PM   88.2dB   86.7dB   86.6dB   88.9dB   89.8dB
02:55:15PM   89.0dB   87.5dB   84.3dB   88.3dB   88.4dB

Peak TIME HISTORY                                                Page    1

1    (Sec)
12-JAN-93
Time           Peak
02:55:10PM  100.7dB  100.7dB  102.0dB  102.0dB  101.9dB
02:55:15PM  106.7dB  106.7dB  104.2dB  100.4dB  100.9dB
```

**GRAPHICAL FORMAT**

```
Lavg TIME HISTORY [Dosimeter 1]                                  Page    1
Weighting     A   Time Constant Slow
Threshold  80dB   Exchange Rate  5dB

1    (Sec)
12-JAN-93             40        60        80       100       120       140
Time           Lavg   +----+----+----+----+----+----+----+----+----+----+
02:55:10PM   87.6dB   ************************
02:55:11PM   84.6dB   ************************
02:55:12PM   84.7dB   ************************


Max TIME HISTORY                                                 Page    1
Weighting     A   Time Constant Slow

1    (Sec)
12-JAN-93             40        60        80       100       120       140
Time            Max   +----+----+----+----+----+----+----+----+----+----+
02:55:10PM   88.2dB   ========================
02:55:11PM   86.7dB   ========================
02:55:12PM   86.6dB   ========================

Peak TIME HISTORY                                                Page    1

1    (Sec)
12-JAN-93             40        60        80       100       120       140
Time           Peak   +----+----+----+----+----+----+----+----+----+----+
02:55:10PM  100.7dB   --------------------------------
02:55:11PM  100.7dB   --------------------------------
02:55:12PM  102.0dB   --------------------------------

             Note:  These printouts have been shortened to save space.
```

**Figure 9**. Time History Printout.

% Time Statistical Distribution Section Figure 10

The % Time Statistical Distribution will appear as follows:

```
% TIME STATISTICAL DISTRIBUTION                                    Page    1
Weighting     A   Time Constant Slow

Total Samples      11198
Total Run        0:05:49

                          0         20        40        60        80       100
 dB    Samples   % Time   +----+----+----+----+----+----+----+----+----+----+
 58         60    0.53%   *
 59         83    0.74%   *
 60         74    0.66%   *
 61        172    1.53%   *
 62        123    1.09%   *
 63        146    1.30%   *
 64         33    0.29%   *
 65         10    0.08%   *
 66         70    0.62%   *
 67         45    0.40%   *
 68         48    0.42%   *
 69        202    1.80%   *
 70        494    4.41%   ***
 71        653    5.83%   ***
 72        668    5.96%   ***
 73       1064    9.50%   *****
 74        733    6.54%   ****
 75        612    5.46%   ***
 76        809    7.22%   ****
 77        472    4.21%   ***
 78        245    2.18%   **
 79        254    2.26%   **
 80        288    2.57%   **
 81        286    2.55%   **
 82        435    3.88%   **
 83        449    4.00%   ***
 84        441    3.93%   **
 85        401    3.58%   **
 86        414    3.69%   **
 87        361    3.22%   **
 88        305    2.72%   **
 89        167    1.49%   *
 90        139    1.24%   *
 91        142    1.26%   *
 92        113    1.00%   *
 93         62    0.55%   *
 94         49    0.43%   *
 95         21    0.18%   *
 96         18    0.16%   *
 97         25    0.22%   *
 98         12    0.10%   *
 dB    Samples   % Time   +----+----+----+----+----+----+----+----+----+----+
                          0         20        40        60        80       100
```

**Figure 10**. % Time Statistical Distribution Printout.

An Exceedance Level Table (LN) will appear as follows:

EXCEEDANCE LEVELS
Weighting A Time Constant Slow

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| L01 | 94dB | L02 | 92dB | L03 | 91dB | L04 | 90dB | L05 | 90dB |
| L06 | 89dB | L07 | 88dB | L08 | 88dB | L09 | 88dB | L10 | 87dB |
| L11 | 87dB | L12 | 87dB | L13 | 86dB | L14 | 86dB | L15 | 86dB |
| L16 | 86dB | L17 | 85dB | L18 | 85dB | L19 | 85dB | L20 | 84dB |
| L21 | 84dB | L22 | 84dB | L23 | 84dB | L24 | 83dB | L25 | 83dB |
| L26 | 83dB | L27 | 83dB | L28 | 82dB | L29 | 82dB | L30 | 82dB |
| L31 | 82dB | L32 | 81dB | L33 | 81dB | L34 | 81dB | L35 | 80dB |
| L36 | 80dB | L37 | 79dB | L38 | 79dB | L39 | 79dB | L40 | 78dB |
| L41 | 78dB | L42 | 77dB | L43 | 77dB | L44 | 77dB | L45 | 77dB |
| L46 | 76dB | L47 | 76dB | L48 | 76dB | L49 | 76dB | L50 | 76dB |
| L51 | 76dB | L52 | 76dB | L53 | 75dB | L54 | 75dB | L55 | 75dB |
| L56 | 75dB | L57 | 75dB | L58 | 75dB | L59 | 74dB | L60 | 74dB |
| L61 | 74dB | L62 | 74dB | L63 | 74dB | L64 | 74dB | L65 | 73dB |
| L66 | 73dB | L67 | 73dB | L68 | 73dB | L69 | 73dB | L70 | 73dB |
| L71 | 73dB | L72 | 73dB | L73 | 73dB | L74 | 73dB | L75 | 72dB |
| L76 | 72dB | L77 | 72dB | L78 | 72dB | L79 | 72dB | L80 | 72dB |
| L81 | 71dB | L82 | 71dB | L83 | 71dB | L84 | 71dB | L85 | 71dB |
| L86 | 71dB | L87 | 70dB | L88 | 70dB | L89 | 70dB | L90 | 70dB |
| L91 | 69dB | L92 | 69dB | L93 | 67dB | L94 | 64dB | L95 | 63dB |
| L96 | 62dB | L97 | 61dB | L98 | 61dB | L99 | 59dB | L100 | 58dB |

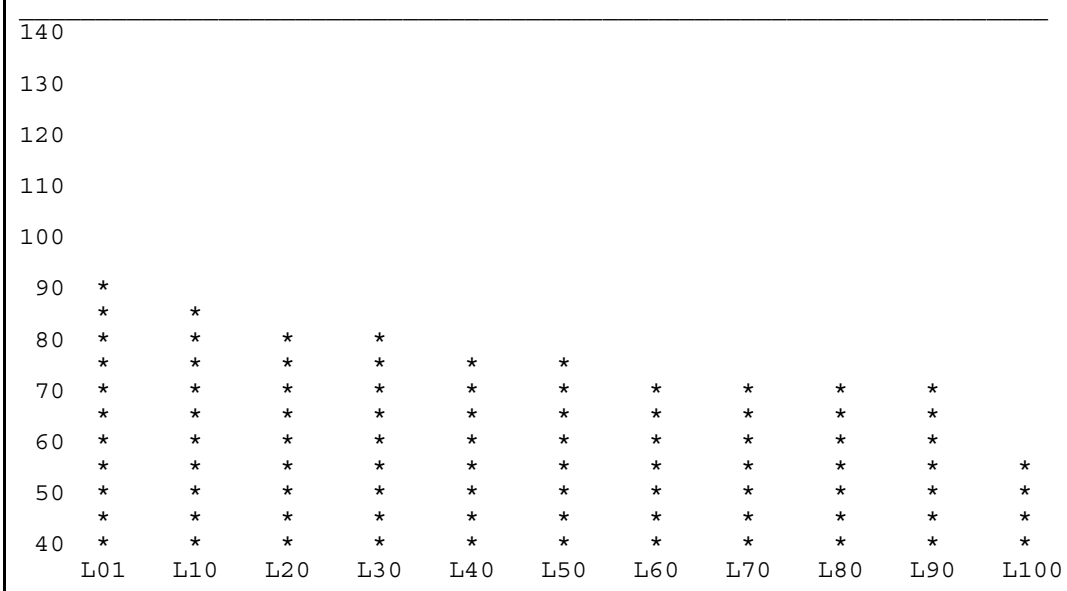


**Figure 11.** Exceedance Levels Printout.

## CALIBRATING THE Q-100

- The Q-100 has a calibration sound pressure level stored in its memory. This level must match that of the Acoustic Calibrator used to calibrate the instrument. The Q-100 has this level factory set to 114.0dB. Use the Q100 DOSIMETER Setup software to change this level.

- Acoustically Calibrate the Q-100 as follows:

  1.) Turn the Q-100 On.

  2.) Turn on the calibrator (1000 Hz). Listen to see if the calibrator is producing a tone.

  - If a tone is heard, proceed to step 3.
  - If no tone is present, see the calibrator's manual to correct the problem.

  3.) Insert the Microphone and Adapter into the calibrator. (See Figure 12.)

  4.) Start the CAL Process by simultaneously pressing the two keys representing CAL on the label.

  - "CAL" will briefly appear in the display while the system is attempting to calibrate.

  5.) When the calibration process is done, one of the following will occur:

  - "FAIL" may appear. If it does, check the system and perform the calibration over again.
  - The actual calibrator dB level will appear on the display. To be a valid calibration, it must match the computer-entered calibrator level by +/- 0.1 dB. If not, check the system and perform the calibration over again.

  6.) After a successful calibration, the Q-100 will be operating in the SPL mode.

- The Sound Level Calibrator output will be affected slightly due to altitude (atmospheric pressure). Therefore, if calibrating at high altitudes, see the calibrator manual for altitude correction values.

NOTE: During calibration the A weighted SPL and C weighted SPL are measured and set equal to each other. The unweighted logging peak detector is also calibrated, setting its output at 3dB above the RMS level shown in the display. The Q100 must be calibrated at a frequency of 1kHz, as this condition is only true at 1kHz.

As the peak detector is most accurate over the upper portion of the range, the calibration value should be in the upper 40dB of the range used for calibration. It is important to not disturb the microphone during the calibration routine, as this may cause a high peak reading and result in bad peak data.

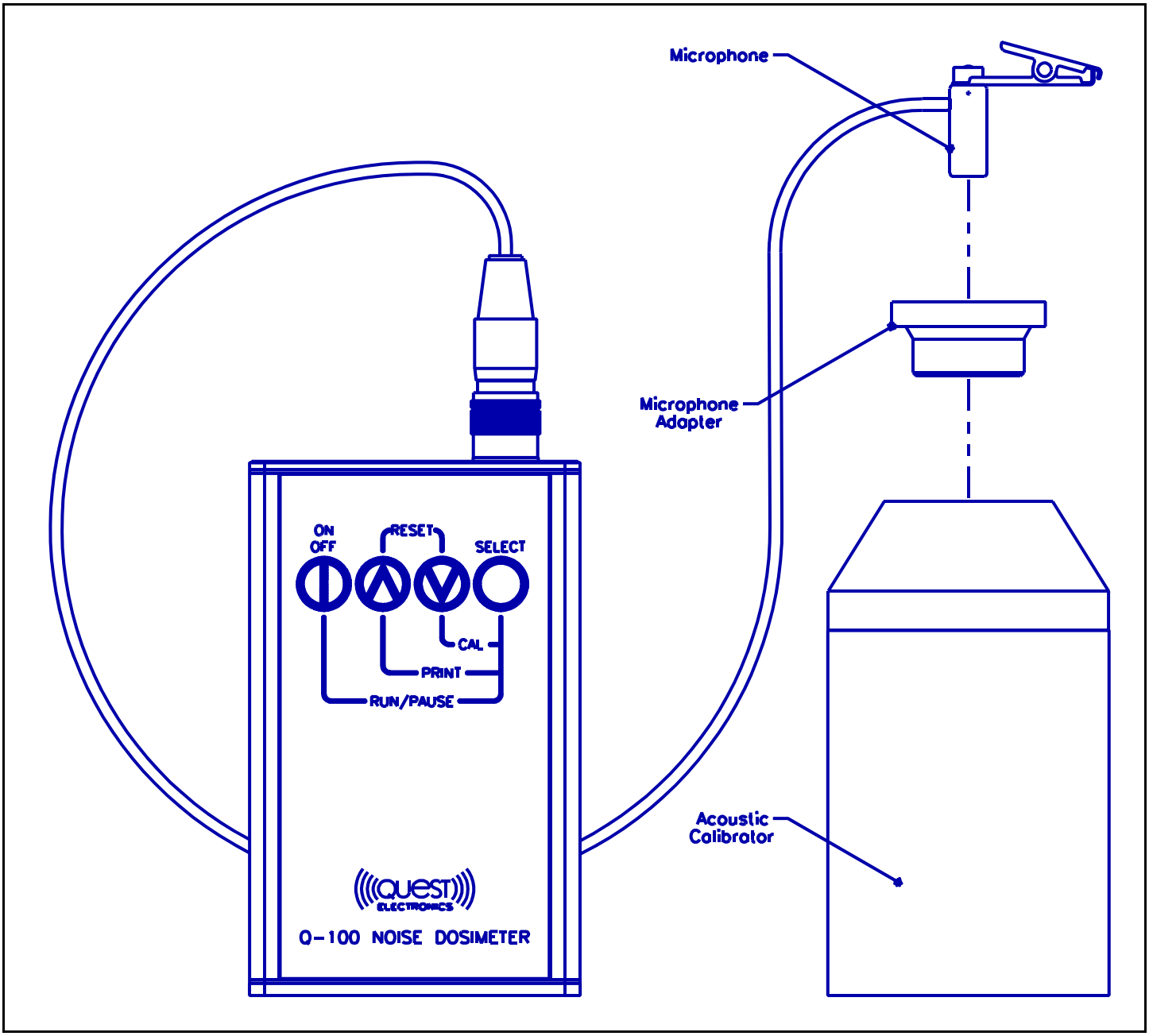


**Figure 12.** Calibrating the Microphone Sensitivity.

The Q-100 will maintain its accuracy for many months of use.

However, it is recommended that the unit be returned once a year to a Quest Authorized Service Station for a complete checkout and recalibration.

Accurate calibration standards are maintained and used by Quest. They are traceable to the National Institute of Standards and Technology (NIST).

## CHECKING THE Q-100 CALIBRATION

It is recommended that the Q-100 calibration be checked before and after each use. This will verify that the unit was in calibration between the checks.

Check the Q-100 Calibration as follows:

1.) Place the unit into the Pause mode.

2.) Turn on the calibrator (1000 Hz). Listen to see if the calibrator is producing a tone.

- If a tone is heard, proceed to step 4.
- If no tone is present, see the Calibrator Manual to correct the problem.

3.) Insert the Microphone and Adapter into the Calibrator.

4.) Read the SPL dB value. It should match the calibrator level by +/- 0.5 dB. If it does, the Q-100 is still in calibration.

NOTE:
If the Q100 is being operated in the (40 dB - 110 dB) range and the calibrator is a 114 dB model, this step may not be be possible due to the overrange of the calibrator. A 94 dB calibrator is better suited for low range calibration and check.

## CHECKING THE Q-100 BATTERY CONDITION

- If the lower left corner of the display indicates "BAT", the battery is low and should be replaced.
- If the lower left corner of the display starts to indicate "BAT" during a measurement period, the battery will be able to operate the unit for at least 8 more hours.

SPECIFICATIONS

Standards:

ANSI S1.25 - 1991 IEC 651 - 1979, type 2
ANSI S1.4 - 1983, type 2 IEC 804 - 1985, type 2
IEC 1252 - 1993

Detector:

True RMS

Frequency Weighting Networks:

"A" and "C" Weighting.

Response:

"SLOW" or "FAST" Response.

Pulse Range:

63 dB from 80 dB (RMS) to 143 dB (Peak)

Measuring Range:

All "A" or "C" Weighted SPL's from 70 dB to 140 dB (143 dB Peak) or from 40 dB to 110 dB (113 dB Peak) depending upon range, will be measured. Note that the highest RMS dB level that can be measured will vary with the Crest Factor of the SPL being measured. For example, with a Crest Factor of 20 dB, the highest RMS dB level that can be measured is 120 dB.

Unweighted Peak SPL's are measured either from 100 dB to 143 dB or from 70 dB to 113 dB depending upon the range setting.

Reference Range / Linearity Range / Primary Indicator Range:

Total Dynamic Range of 70 to 140 dB, High Range (Sinusoidal Signal) or 40 to 110 dB, Low Range (Sinusoidal Signal). Type 2 accuracies apply to these Dynamic Ranges.

Level Linearity:

Within the Primary Indicator Range, referenced from the Reference SPL (114 dB), tested with a sinusoidal input signal, it is within +/- 0.7 dB.

Microphone:

8mm Shoulder-Mount, Type 2 (with cable and connector)

Reference SPL:

114 dB

Reference Frequency:

1 kHz

Calibration at the Reference SPL and Reference Frequency:

Performed with an acoustic calibrator.
114 dB (Reference SPL) at 1 kHz (Reference Frequency).

- Note that other Reference SPL's can be used (preferably between 90 dB and 115 dB), but the Reference Frequency must always be 1 kHz.

See "CALIBRATING THE Q-100" for more detail.

Reference Direction:

The microphone used on the Q-100 is a Random Incidence (Diffuse Field) type. The angle of incidence is 70°.

Warm-Up and Settling Time:

10 seconds. The display will count down from "ini9" to "ini1" at unit turn-on. Warm-Up and Settling occur during the count down.

Fixed Integration Periods:

Normally, the Q-100 integrates over the period that is desired. However, it can be programmed by the user for a fixed integration period (Timed Run). This period can be set in 1 minute increments from 1 minute to 99 hours and 59 minutes.

Integration Time:

Signal dependent: With a 3dB exchange (doubling) rate and a constant level of 140dB the integration time would be 62 hours. As the signal level decreases and the exchange rate increases, the integration time increases to 145 hours max.

Display:

Liquid Crystal Display, 4 Digits with the following Annunciators:
BAT, RUN, DOSE, 8, LAVE, 3, SPL, MAX, SEL, EXP, and TWA.

Data Output:

Uses Interface Modules to condition the data.
Baud: 9600
Connector: Uses the microphone connector to communicate with each Interface Module.

See the APPENDIX A for more information on:
Parallel Printer Interface
Serial Communications Interface

Battery:

Single 9-volt alkaline.

Battery Life:

Approximately 45 Hours. Shelf life is approximately 4 months due to memory and clock requirements.

Battery Test:

"BAT" appears in the display when the battery is low. From the first indication, the battery will operate the unit for at least 8 more hours.

Memory and Clock/Calendar Battery Backup:

Lithium cell, 2 to 3 year life not including time that the 9 volt battery is removed. For long life, keep a good 9 volt battery installed.
(Replacement only by Authorized Service Center)

## Temperature Effects:

Operating Temperature Range: -10° to +50°C

Accuracy over the Operating Temperature Range (at 65% relative humidity) is within +/- 0.5 dB of the 1 kHz Reference Level (114 dB) when calibrated at 20°C and 65% relative humidity.

Storage Temperature Range (battery removed): -20° to +60°C

Do not exceed the Storage Temperature Range because possible damage to the unit may result.

## Humidity Effects:

Operating Humidity Range: 30 to 90% relative humidity.

Accuracy (at 40°C) over the Operating Humidity Range is within +/- 0.5 dB of the 1 kHz Reference Level (114 dB) when calibrated at 40°C and 65% relative humidity.

Maximum Humidity Limitation:

Do not exceed 95% relative humidity for long periods of time because possible damage to the unit may result.

## Electromagnetic Field Effects:

Negligible below 50 Oersteds at 50 to 60 Hz.

Tested for RF susceptibility with < 1dB error at field strengths to 10 V/m over the frequency range of 10 MHz to 500 MHz.

## Size:

4.5 x 2.8 x 1.0 inches (114 x 71 x 26 mm)

## Weight:

11.5 ounces (326 grams) including microphone.

## Construction:

Extruded aluminum housing, fully immersible.

## General Characteristics

The Q-100 utilizes low power state-of-the-art circuitry. The Q-100 is very stable and reliable over a wide range of environmental conditions.

The low power circuitry gives the unit a long battery life. When the battery is changed, all stored information is retained due to an internal Lithium battery. The Lithium battery lasts for many years before needing replacement. (See SPECIFICATIONS)

A Keypad is used to select and display various data. To program various parameters, the Q-100 uses a personal computer with Quest Q100 DOSIMETER Setup Software.

To see the basic internal operation of the Q-100, a block diagram is shown in Figure 13.

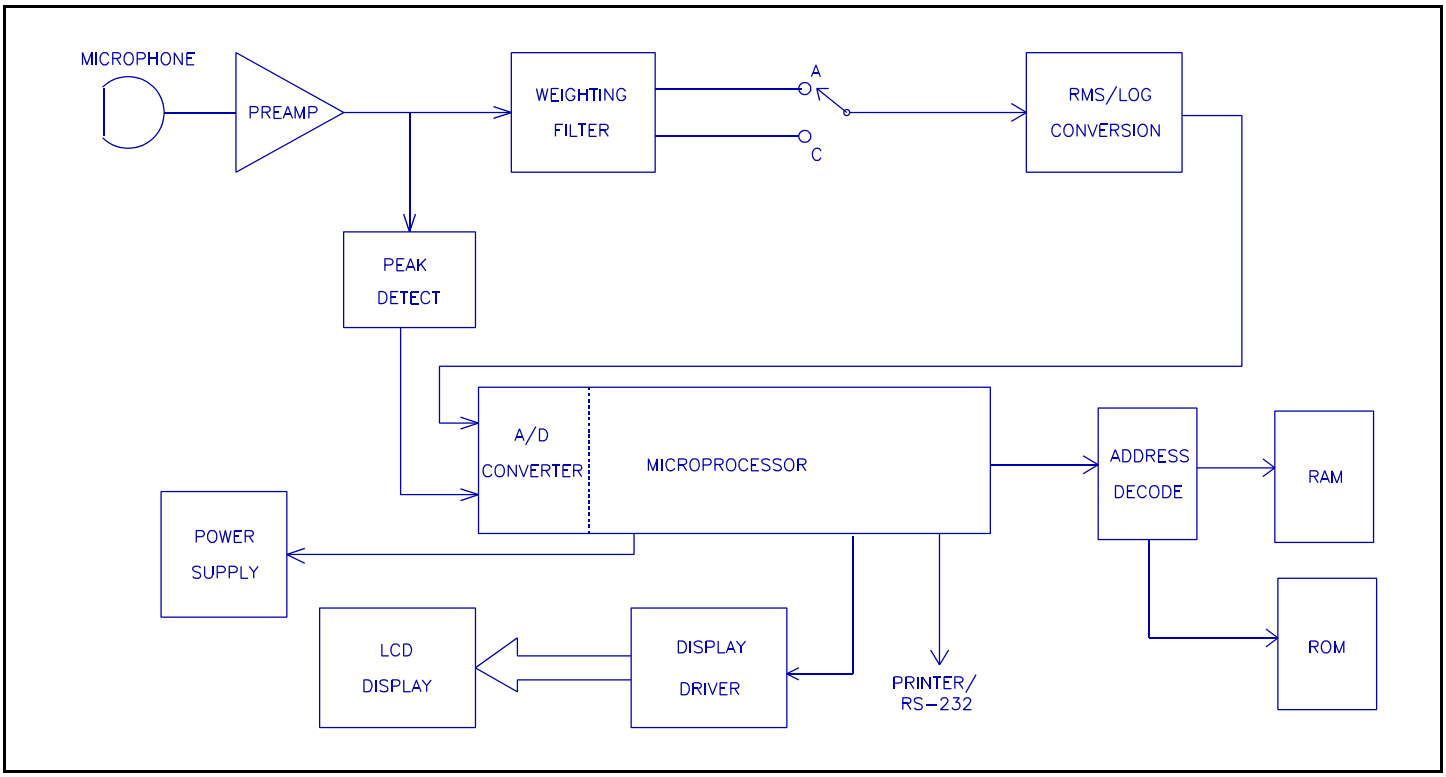


**Figure 13.** Block Diagram of the Q-100.

## Microphone Characteristics

The Q-100 Noise Dosimeter uses an 8 mm omnidirectional ceramic microphone. It is buffered by a high impedance FET input stage. (See Figure 14.)

### Weighting Characteristics

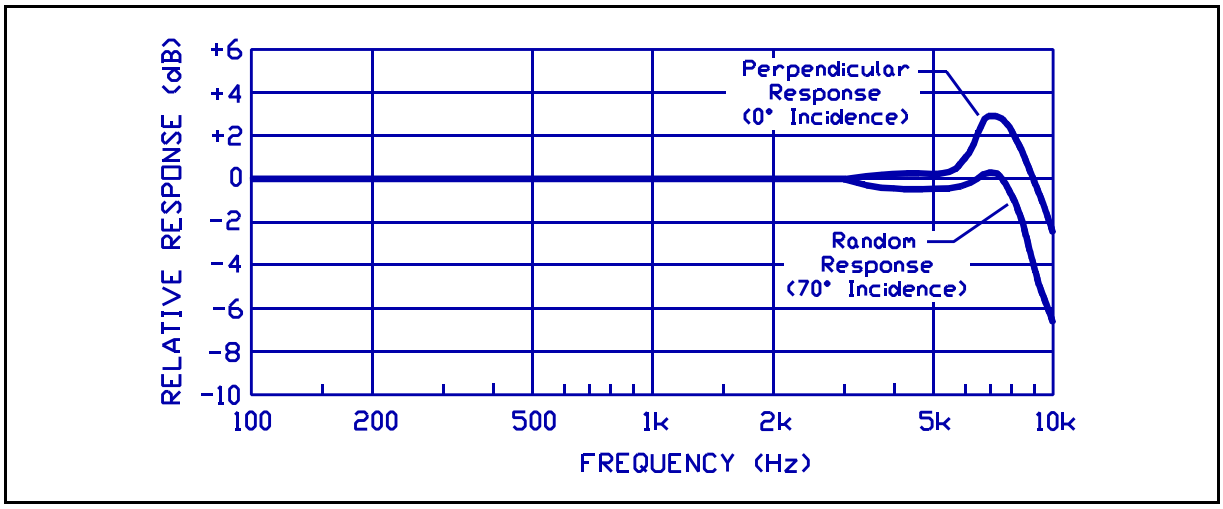


**Figure 14.** Q-100 Microphone Frequency Response.

The Q-100 has both "A" and "C" weighting characteristics as shown in Figure 15. For most industrial and community noise measurement requirements, the "A" weighting should be used. The "A" weighting has a response similar to the human ear. The "C" weighting is used for measuring noise reduction in hearing protectors and other scientific purposes.

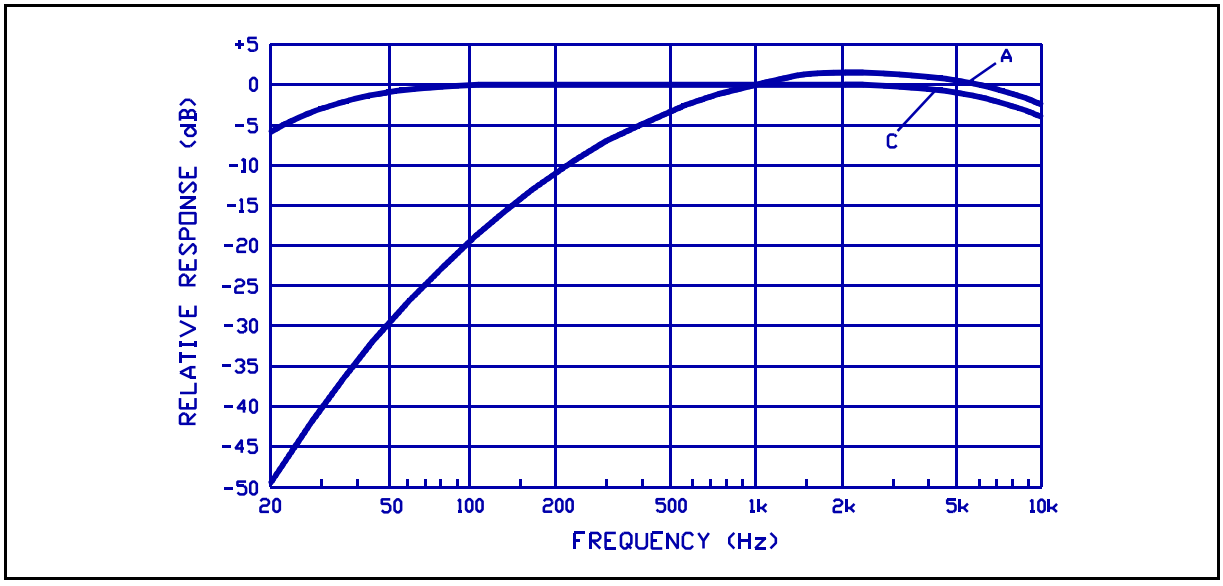


**Figure 15.** A and C Weighting.

## SECURITY

The Q100 has a security feature which, if enabled, locks the dosimeter controls while in RUN unless a 4 digit code is entered. If secured, the display will show "____". To disable the security, use the arrow keys to set the first digit and press SELECT to enter that digit. Repeat for the next three digits. If the code is successfully entered, the dosimeter will function normally.

The four digit code is entered from either the Q100 Setup software or Quest Noise Manager pc support software.

Security is enabled from the keypad by placing the Q100 into RUN while "SEC" shows in the display. This display is reached by pressing the arrow keys, but is only available if security has been enabled through the software package.

Another security option involves the Auto-On feature. Using the software, the Q100 may be configured to automatically turn on and RUN at a specific time. If Auto-On Security has been selected, it will be secured while it is in RUN.

## TYPICAL OPERATING PROCEDURE

### As a Personal Noise Dosimeter

1.) Use the computer and Q100 DOSIMETER Setup software to check the Q-100 setup. Be sure that it is proper for the application. Change where needed.

2.) Reset the Q-100.

3.) Perform a Calibration of the Q-100. (See CALIBRATING THE Q-100.)

4.) Attach the microphone to the operator's shirt as shown in Figure 16. Keep it high on the shoulder and away from the neck as far as practical.

5.) Simultaneously press the two keys representing RUN/PAUSE to place the Q-100 into the RUN mode.

6.) Attach the unit to the operator's belt or pocket.

7.) At the end of the measurement period, remove the unit from the operator's belt or pocket.

8.) Simultaneously press the two keys representing RUN/PAUSE to place the Q-100 into the PAUSE mode.

9.) Remove the Q-100 and microphone from the operator.

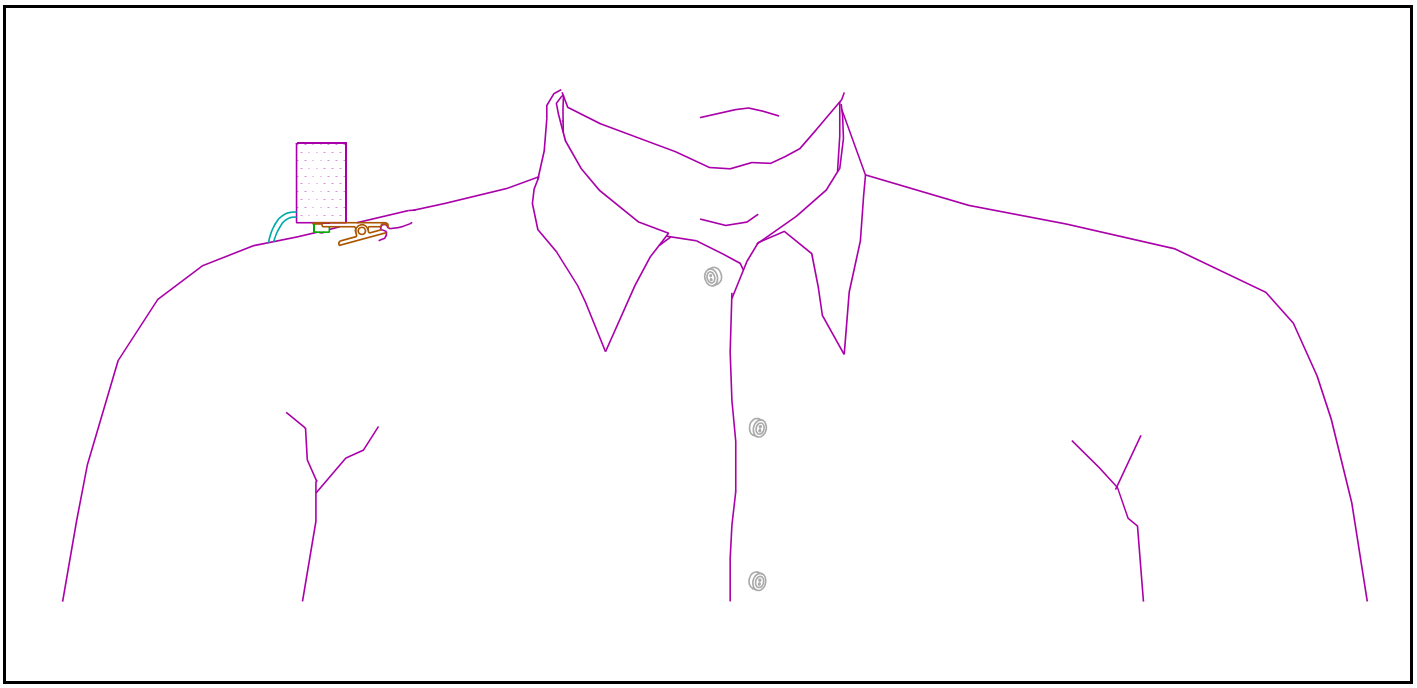

**Figure 16.** Placement of Microphone When Used as a Personal Monitor.

10.) Perform a Check of the Q-100 at the end of the measurement period if necessary. (See CHECKING THE Q-100 CALIBRATION.)

11.) Evaluate the desired data by the following method(s):

- Read out the desired data using the Q-100 Display.
- Use a printer (or computer) to list a printout.
- Transfer the data to a computer for further analysis using the Questware "Noise Manager" software.

12.) Turn the Q-100 off.

## As an Environmental Monitor

Use the Q-100 as an Environmental Monitor as follows:

1.) Use the computer and Q100 DOSIMETER Setup software to check the Q-100 setup. Be sure that it is proper for the application. Change where needed.

2.) Perform a Calibration of the Q-100. (See CALIBRATING THE Q-100.)

3.) Connect the Microphone Boom to the Q-100.

4.) Wrap the cable neatly around the Boom and connect the microphone to the top of the Boom.

5.) Attach the unit to a tripod if desired.

6.) Point the microphone upward forming approximately a 70 degree angle with the noise source.

7.) Reset the Q-100.

8.) Simultaneously press the two keys representing RUN/PAUSE to place the Q-100 into the RUN mode.

9.) Perform the measurement for the desired time period.

10.) Simultaneously press the two keys representing RUN/PAUSE at the end of the period to place the Q-100 into the PAUSE mode.

11.) Perform a Check of the Q-100 at the end of the measurement period if necessary. (See CHECKING THE Q-100 CALIBRATION.)

12.) Evaluate the desired data by the following method(s):

- Read out the desired data using the Q-100 Display.
- Use a printer (or computer) to list a printout.
- Transfer the data to a computer for further analysis using the Questware "Noise Manager" software.

13.) Turn the Q-100 off.

## As a Survey Event Monitor

Up to 999 different Events can be stored.

1.) Check all Q-100 setups that are relevant to the measurement. Change where needed.

2.) Reset the Q-100. This clears all stored data.

3.) Perform a Calibration of the Q-100. (See CALIBRATING THE Q-100.)

4.) Connect the Microphone Boom to the Q-100.

5.) Wrap the cable neatly around the Boom and connect the microphone to the top of the Boom.

6.) Point the microphone upward forming approximately a 70 degree angle with the noise source.

7.) Run and Pause the Q-100 for each event location as needed. Accumulate as many Events as desired.

1st Location: Event will be # 1.
2nd Location: Event will be # 2.
etc.

- Event data is only displayed in the Q-100 if both dosimeters have the same threshold. Then the event data will be displayed instead of dosimeter 2. Otherwise it only will appear in the printout. Therefore, as measurements are made, list each location along with its associated event number.

Be sure that a representative sample of noise in each location has been accumulated.

8.) Evaluate the desired data by the following method(s):

- Read out the desired data using the Q-100 Display.
- Use a printer (or computer) to list a printout.
- Transfer the data to a computer for further analysis using the Questware "Noise Manager" software.

9.) Turn the Q-100 off.

## ACCURACY

For maximum accuracy, it is important to use the Q-100 correctly and to understand its limitations.

It will correctly integrate all sound levels within its operating ranges of 70 to 140 dB or 40 to 110 dB ("A" or "C" Weighting).

A few items related to accuracy are as follows:

### Low Level Measurements

The Q-100 will accurately measure and display "A" and "C" weighted SPL down to the bottom of the selected measuring range. Values below this are displayed as **"LO"**. (See SPECIFICATIONS, Measuring Range.)

- Functions such as TWA and LEQ are computed from SPL's. Since these are computed values, they can read below 70 dB and still be valid.
    - For example, a 1 hour LAVG (5dB Exchange Rate) of 75 dB will calculate to (and be displayed as) a TWA of 60 dB.

### Accuracy of Readings

There is a tendency to overestimate the accuracy of digital readings.

The values (such as LEQ) are computed to a precision of 0.1 dB. However, the absolute accuracy of the reading is not 0.1 dB, but is accurate to the overall stated tolerance of the instrument.

The 0.1 dB resolution is useful in determining the minimum sample time required to get an accurate short term measurement.

- If, for example, the Leq is fluctuating 0.3 dB every second, then a longer sample time is required.
- If the Leq is remaining stable from second to second within a few tenths of a dB, then the sample time is long enough.

## Microphone Positioning

The Q-100 measures sound most accurately without the presence of sound reflecting or absorbing objects.

Any near-by object or surface (including the operator) will act as a reflector or absorber of sound.

To minimize these errors, use the Q-100 as follows:

- When taking Hand-Held measurements:
  - Connect the Microphone Boom. (See USING THE MICROPHONE BOOM.)
  - Hold the Q-100 with your arm extended.
  - Point the microphone upwards at about a 70 degree angle from the noise source.
- When taking Tripod-Held measurements:
  - Connect the Microphone Boom. (See USING THE MICROPHONE BOOM.)
  - Mount the Q-100 to the tripod mount located on the belt clip.
  - Position the Q-100 so that the microphone points upwards at about a 70 degree angle from the noise source.
- When taking Personal Noise Dosimeter Measurements:
  - Connect the Microphone to the shirt collar. (See Figure 16.) Keep it high on the shoulder and away from the neck if possible.
  - If the noise seems to be coming from one location, place the microphone near the ear facing that location.
  - Keep the Model WS-5 Windscreen on the microphone. It helps to do the following:
    - holds the microphone in an upright position.
    - keeps the microphone from brushing against clothing. This can produce higher than normal noise levels into the microphone.

## Microphone Windscreen

It is recommended that the Model WS-5 Windscreen be used at all times. Using the windscreen will improve the accuracy by minimizing the effect of the following:

- Wind blowing across the microphone can produce higher than normal sound level readings.
  - The windscreen blocks wind from direct contact with the microphone, producing less unwanted noise.
- Clothing brushing against the microphone can produce higher than normal sound level readings.
  - The windscreen helps position the microphone so that clothing cannot brush against it as easily.
- Dirt entering the microphone, in time, can damage it.
  - The windscreen catches and collects this dirt before it enters the microphone.

Simply insert the microphone into the Model WS-5 Windscreen and gently pull it over the Velcro strip.

## Windscreen Attenuation

The acoustic attenuation effect of the windscreen on the dosimeter is very small and for all practical purposes can be neglected. Maximum attenuation occurs at high frequencies and is approximately:

0.0 dB below 2 kHz
0.3 dB at 5 kHz
0.5 dB at 8 kHz

TROUBLESHOOTING

Blank display when the Q-100 is turned on:

- Change the battery with a known fresh battery.

Unit does not calibrate:

- Low Battery Indicator (BAT) must not be on.
- Check the Calibrator; Listen for a tone from its output.
- Reset the Q-100 and try again.
- Try a different microphone if you have another dosimeter.
  If this works the microphone needs replacing.
- Make sure that the level of the calibrator matches the calibration level stored in the Q-100's memory.

Unit is erratic:

- Try another microphone if you have another unit.
  (The microphone could be intermittent, loose cable, etc.)

If the above attempts to restore normal operation are unsuccesful, return the Q-100 to Quest or an authorized service center for service.

Memory Warning Messages

At turn on, the display normally briefly displays the software revision "r2.xx" followed by an initialization countdown "InI8", "InI7", etc. If, instead of "InIx", "dFxx" is displayed, some setup information has been lost, probably due to a weak internal memory backup battery. The battery should be replaced by an authorized Quest service center.

dF1x indicates that the peak calibration values have been lost, resulting in inaccurate peak readings.

dF2x indicates that the serial number has been lost. The serial number may be re-entered in memory by sending the command #SAQxxxxxxxx (where xxxxxxxx is the remainder of the unit's serial number) via the serial interface module. A communications package such as Procomm or Windows Terminal may be used.

dF4x indicates that the dosimeter setup information has been lost. Setup has reverted back to factory default settings. Check setup parameters via the Q-100 setup program before performing a study.

dF3x indicates that both 1 and 2 have occurred.

dF5x indicates that both 1 and 4 have occurred.

dF6x indicates that both 2 and 4 have occurred.

dF7x indicates that 1, 2 and 4 have occurred.

ACCESSORIES

## Microphone

56-963 8mm Shoulder-Mount Q-100 Dosimeter Microphone, Type 2 (with cable and connector)

56-830 Clothing Clips, package of 5, for microphone cable.

58-852 Earloops to hold microphone at the ear(10 per pack)

## Windscreen

58-452 WS-5 Windscreen (8mm I.D.), package of 10.

## Data Interface Modules

56-957 Parallel Printer Interface
(Centronics Compatible)

56-956 Serial Communications Interface (older version)
(25-pin, RS-232 Female)

- Powered by either:
  - (One 9 Volt Battery, included)
  - (MODEL 920 AC Power Supply, not included)

56-707 Serial Communications Interface (newer,self powered)

## Printer

80 Column Parallel Printer, 110 volt only.

## Questware Software

- All of the following software includes the Serial Communications Interface, 56-956 or 56-707

56-236 "Set-Up" Software (5.25" Floppy)

56-235 "Set-Up" Software (3.5" Floppy)

"Questsuite For Windows" PC support software

## Calibrator Adapters

58-839 Calibrator Adapter (8 mm Mic. to 1 1/8 inch Coupler) Fits CA-12, CA-15, CA-22, CA-32

56-989 Calibrator Adapter (8 mm to 1 inch) Fits QC-10, QC-20

## Tripods

59-045 TP-1 Tripod
(Large - will not fit into carrying cases)
59-046 TP-2 Tripod (Small - fits into some carrying cases)

## QUEST SERVICE AND WARRANTY POLICY

### Service Policy

The Quest product you have purchased is one of the finest acoustic instruments available. It is backed by our full one year warranty which seeks complete customer satisfaction. This is your assurance that you can expect prompt courteous service for your equipment from the entire Quest service organization.

Should your Quest equipment need to be returned for repair or recalibration, please contact the Service Department at 1(800)245-0779 (USA) or Fax (414)567-4047 for a Return Authorization Number. The RA number is valid for 30 days, and must be shown on the shipping label and purchase order/cover letter. If you are unable to return instruments in that time call for a new RA number. Send it prepaid and properly packed in the original shipping carton directly to Quest Technologies, 510 S. Worthington St., Oconomowoc, WI 53066 U.S.A.

Repair or replacement work done under warranty will be performed free of charge, and the instrument will be returned to you prepaid. Your copy or a photocopy of the Quest Registration Card will serve as proof of warranty should the factory require this information.

If for any reason you should find it necessary to contact the factory regarding service or shipping damage, please direct your calls or letters to the attention of the Service Manager, Quest Technologies, (414) 567-9157 or (800) 245-0779. Office hours are from 8 AM to 5 PM (Central Standard Time) Monday through Friday.

### Warranty:

Quest Technologies warrants our instruments to be free from defects in materials and workmanship for one year under normal conditions of use and service. For U.S.A. customers we will replace or repair (our option) defective instruments at no charge, excluding batteries, abuse, misuse, alterations, physical damage, or instruments previously repaired by other than Quest Technologies. Microphones, sensors, printers and chart recorders may have shorter warranty periods. This warranty states our total obligation in place of any other warranties expressed or implied. Our warranty does not include any liability or obligation directly resulting from any defective instrument or product or any associated damages, injuries, or property loss, including loss of use or measurement data.

For warranty outside the U.S.A., a minimum of one year warranty applies to the same limitation and exceptions as above with service provided or arranged through the authorized Quest sales agent or our Quest European Service Laboratory. Foreign purchasers should contact the local Quest sales agent for details.

# APPENDIX A

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**Glossary**

**Acoustical Definitions**

All definitions are in reference to the way that they are used in the Q-100.

---

**BAUD:** Units: Bits per Second

**Baud Rate**

The rate of data transfer between the Q-100 and a computer (or printer) in the serial output mode.

---

**CL:** Units: decibels (dB)

**Criterion Level**

It is the constant sound level that, if applied for 8 hours, would accumulate a DOSE of 100%. (Used in Dose measurements.)

---

**COM PORT:**

The DOSIMETERS (All Models) communicate with the computer via the RS-232C communications port in the back of the computer.

---

**DOSE:** Units: Percent (%)

**Dose**

A percentage of the maximum allowable daily noise dose. This as a computation that is based on the following variables: Criterion Level (CL), Lower Threshold (LT), and Exchange Rate (ER).

---

**EOL:** Units: LF and CR

**End of Line Character**

These are printer instructions that can be placed at the end of each line of type in the printout. The Q-100 uses a Carriage Return (CR) followed by a Line Feed (LF).

---

**ER:** Units: decibels (dB)

**Exchange Rate**

It is the number of dB that a sound must change to either halve or double the rate of dose accumulation.

(3, 4, 5, or 6 dB exchange rates are common.)

---

**EVENTS**: Units: Each occurrence

**Events**

Each time that the Q-100 is in the Run mode and then Pauses creates an event.

**EXP**: Units: Pascal Squared Hours ($Pa^2H$)

**Exposure**

It is a method of measuring dosage. $Pa^2H$ is a linear unit rather than a percentage.

1 Pascal is equal to 94 dB. 94 dB for 1 Hour equals 1 $Pa^2H$.

Examples of the 94 dB/time relationship:

- 94 dB for 1 Hour = 1.00 $Pa^2H$
- 94 dB for 8 Hours = 8.00 $Pa^2H$

The accumulation of $Pa^2H$ will double (or halve) for every 3 dB of change from 94 dB as follows:

- 97 dB for 1 Hour = 2.00 $Pa^2H$
- 94 dB for 1 Hour = 1.00 $Pa^2H$
- 91 dB for 1 Hour = .50 $Pa^2H$
- 88 dB for 1 Hours = .25 $Pa^2H$
- 85 dB for 1 Hours = .125 $Pa^2H$

1 $Pa^2H$ is typically the maximum allowable Exposure.

- 85 dB for 8 Hours = 1 $Pa^2H$

**FAST**:

Units: Time (milliseconds)

**Fast Response**

A Time Constant of 125 milliseconds. When Fast is used, a fluctuating noise into the Q-100 will cause SPL to closely track the fluctuation.

**<"KEY">+<"KEY">:**

When a plus sign appears between keynames, it means that you must hold down the first key and then depress the second, as in <Alt> + <Esc>, for example.

**LAVE**: Units: decibels (dB)

**Average Level**

It is the average sound level for the measurement period based on either a 4, 5, or 6 dB Exchange Rate (ER). If the Exchange Rate (ER) is 3 dB, then LAVG is referred to as LEQ.

**LEQ**: Units: decibels (dB)

**Equivalent Continuous Sound Level**

It is the average sound level for the measurement period based on a 3 dB Exchange Rate (ER).

If the Exchange Rate (ER) is 4, 5, or 6 dB, then LEQ becomes LAVG.

**LN**: Units: decibels (dB) / % of Run Time

**Exceedance Level**

Each Exceedance Level shows the level that was exceeded for the percentage of total Run Time.

**MAX**: Units: decibels (dB)

**Maximum Level**

The highest sound pressure level that occurs during a given time period.

**MIN**: Units: decibels (dB)

**Minimum Level**

The lowest sound pressure level that occurs during a given time period.

**PEAK**: Units: decibels (dB)

**Absolute Unweighted Peak**

It is the highest instantaneous sound pressure that occurs during a given time period.

**DOSE 8**: Units: Percent (%)

**8 Hour Projected Dose**

It is computed by measuring dose for some time period and extrapolating it to an 8 hour time period.

(Example: 25% Dose / 4 hrs = 50% Projected Dose / 8 hrs)

**SEL:** Units: decibels (dB)

**Sound Exposure Level**

It is the constant sound level which, if lasting for one second, would deliver the same amount of acoustical energy as that delivered over the entire measurement period.

Technically speaking, it is usually measured with a 3 dB Exchange Rate. However, the Q-100 will also allow SEL to be measured with 4, 5, or 6 dB Exchange Rates. On a printout, the exchange rate is shown in parenthesis.

---

**SLOW:** Units: Time (seconds)

**Slow Response**

A Time Constant of 1 second. When Slow is used, a fluctuating noise into the Q-100 will cause SPL to operate in a much slowed-down fashion.

---

**SPL:** Units: decibels (dB)

**Sound Pressure Level**

It is the sound pressure, referenced to 20 uPa. (Also referenced to 0.00002 Pa or 0.00002 $N/m^2$). The word "Level" indicates that the sound pressure is a certain level above the reference level. The SPL is displayed each second as the maximum value (Slow or Fast Response) for the previous 1 second period.

**STATISTICS:**

**% Time Statistical Distribution**

For a given run time, the percentage of time that a sound level occurred at a specific dB level.

---

**TIME HISTORY:** Units: Listed Form (Min. or Sec.)

**Time History**

A Printout list (and Graph) showing how levels were accumulated over time. A printout can be made for each of the following: Lavg, Lmax, Peak, and LC-A.

C - A is used mainly when determining earmuff noise reduction effectiveness.

---

**TL:** Units: decibels (dB)

**Threshold Level**

It is a preset dB level below which sound is not accumulated or averaged into LAVG, LEQ, or Dose.

---

**TWA (Prt):** Units: decibels (dB)

**Projected Time Weighted Average**

It is used to determine the TWA when the operator wishes to use a measurement time that is different from the worker's exposure time.

Note that a short term sample can only be used if the average noise in the work area is relatively constant.

For example, a worker is only working a 4 hour day and you wish to determine the worker's TWA by making a 5 minute measurement, do as follows:

1.) Program the Projection Time (Prt) to 4 hours. Note that the preset time period can be set from 1 to 16 Hours in 1/4 Hour steps.

2.) Take a 5 minute sample. This average level is then assumed to be constant over the Projection Time (Prt).

3.) Read out the Projected Time Weighted Average [TWA (Prt)].

---

**TWA:** Units: decibels (dB)

**Time Weighted Average**

It is the sound level that is accumulated for any time period but with its average level computed over an 8 hour time period.

- If the time period is less than 8 hours, the Time Weighted Average will always be less than the Average Sound Level (LAVG).
- If the time period is more than 8 hours, the Time Weighted Average will always be more than the Average Sound Level (LAVG).

It is usually measured with A Weighting, Slow Response, and a 5 dB Exchange Rate. However, the Q-100 will allow either A or C-Weighting, either Slow or Fast Response, and either a 3, 4, 5, or 6 dB Exchange Rate.

---

**UL:** Units: Minutes / Seconds

**Upper Limit Time**

It is the total time that the sound level exceeds a preset level.

**Acoustical Formulas**

The Q-100 uses the following formulas to calculate the accumulated data:

$$Dose = \frac{100}{TC}\left[\int_0^{RTIME} 2^{(LS-CL)/ER}\, dt\right]$$

$$PrD_{8\ HOURS} = DOSE \times \frac{TC}{RTIME}$$

$$PrD_{x\ HOURS} = DOSE \times \frac{Prt}{RTIME}$$

$$L_{AVG} = ER\left[LOG_2\int_0^{RTIME} 2^{LS/ER}\, dt - LOG_2(RTIME)\right]$$

$$L_{EQ} = 3.01\left[LOG_2\int_0^{RTIME} 2^{LS/3.01}\, dt - LOG_2(RTIME)\right]$$

$$SEL = ER\left[LOG_2\int_0^{RTIME} 2^{LS/ER}\, dt\right]$$

$$TWA = ER\left[LOG_2\int_0^{RTIME} 2^{LS/ER}\, dt - LOG_2(TC)\right]$$

$$TWA_{x\ HOURS} = L_{AVG} + ER \times LOG_2\left[\frac{Prt}{TC}\right]$$

$$Pa^2H = \left[2^{(L_{EQ}-94)/3.01}\right]\frac{RTIME}{3600}$$

$$LHIST = ER \left\lfloor LOG_2 \int_0^{HTIME} 2^{LS/ER}\, dt - LOG_2(HTIME) \right\rfloor$$

$$\%\ TIME\ STAT\ DIST = 100 \times \frac{SC}{TS}$$

**Where:**

LS = Sound Level in dB with the selected Time Constant (Slow or Fast). Its value is entered only when the Sound Level is greater than the Threshold Level. It is entered as minus infinity if the level is less than the Threshold Level.

TC = 8 Hour Criterion Time. Enter 28800 seconds.

RTIME = Run Time in seconds.

ER = Exchange Rate in dB. (Selectable 3, 4, 5 or 6 dB)

CL = Criterion Level in dB. (Selectable 40 to 140 dB)

LHIST = Integrated Level stored either in 1 second, 10 second, or 1 minute periods based on the programmed Logging setup.

HTIME = Time (in seconds) used to compute Time History. (Selectable: 1 second, 10 seconds, or 1 minute.)

SC = Sample Counts. The number of samples occurring at the same dB level.

TS = Total Samples. The total number of samples during the Run Time.

Prt = Projection Time in seconds.

For definitions of the following:

| | | |
|---|---|---|
| DOSE | CL | LAVG |
| PrD (Projected Dose) | ER | LEQ |
| TWA | $Pa^2H$ (Exposure) | SEL |
| TWA (Projected TWA) | % TIME STAT DIST | |

See APPENDIX A, Acoustical Definitions.

**Microphone Input / Data Output Connector**

The Connector of the Q-100 has 2 functions:

- Connects the Microphone / Cable Assembly.
- Connects to one of the following INTERFACE Module:
  - PARALLEL PRINTER INTERFACE Module
  - SERIAL COMMUNICATIONS INTERFACE Module

The functions for the 10 terminals within the connector are as follows:

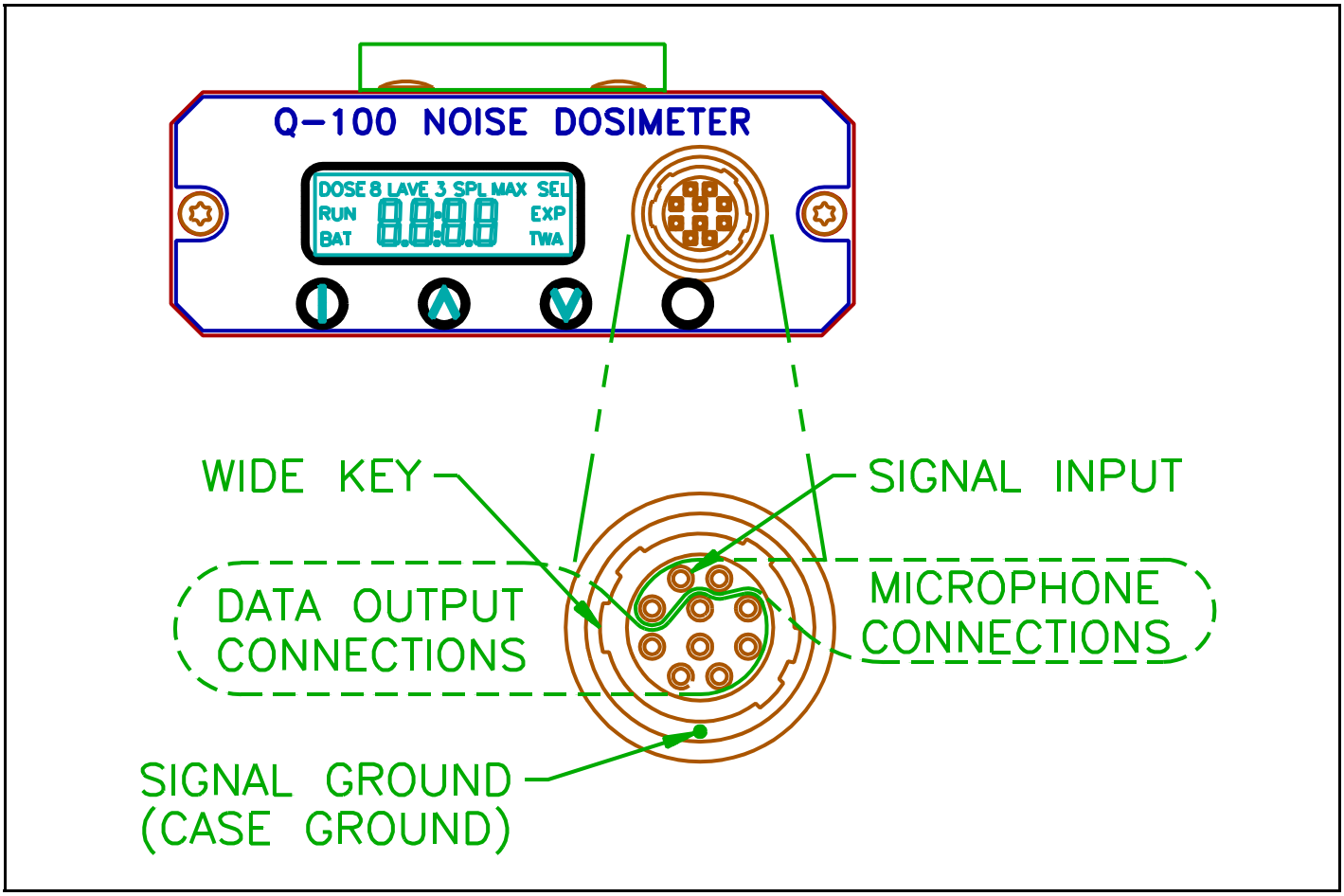


**Figure 17.** Microphone Input / Data Output Connector.

**Parallel Printer Interface**

The 056-957 Parallel Printer Interface is compatible with most Centronic compatible printers. The 056-957 contains electronics which converts data from the Q-100 into parallel information. The electronics are powered from the Q-100. (An older version of this cable required its own 9 volt battery.)

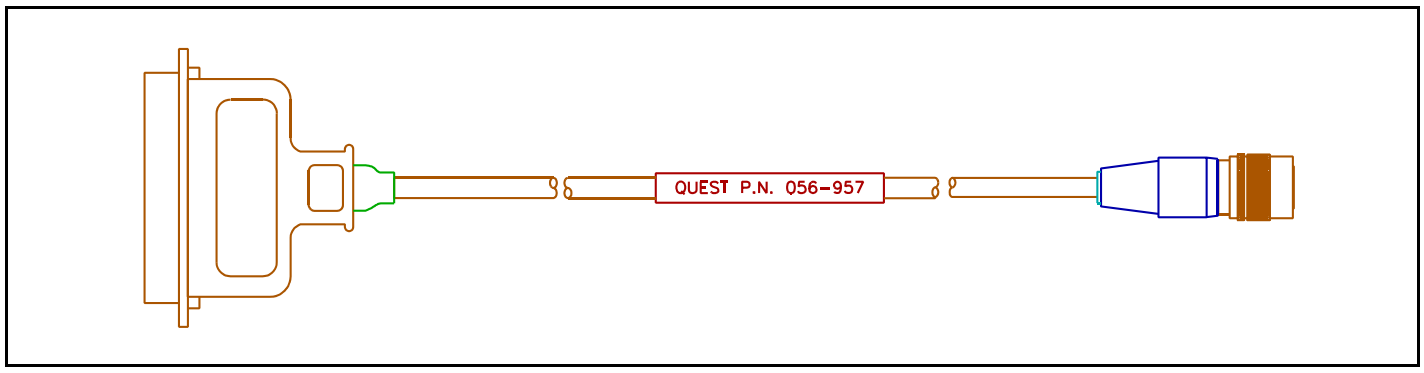


**Figure 18**. Parallel Printer Interface.

The Output Format of the Parallel Printer Interface:

- The Q-100 sets up 8 data lines.
  - If the Busy line is not high, the Q-100 sends a Strobe pulse.
  - If the Busy line is high, the Q-100 will wait.

**Serial Communications Interface**

Use of the Serial Communications Interface allows the Q-100 to communicate with a Computer RS-232 Port or serial printer operating at 9600 baud.

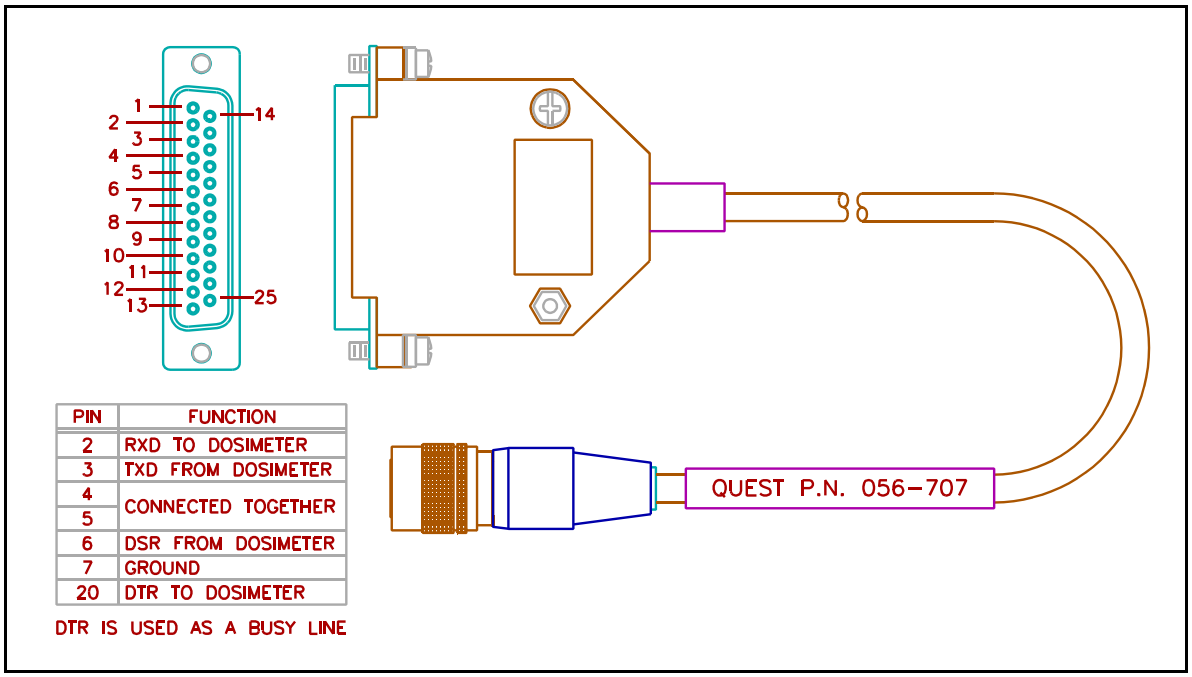


**Figure 19.** Serial Communications Interface.

The Output Format of the Serial Communications Interface:

- The Output is RS-232 compatible.
- The Q-100 Baud Rate is 9600. This Baud Rate passes through the Serial Communications Interface. The computer COM Port must also be set with the Q100 DOSIMETER Setup software to match the 9600 Baud.
- Each character consists of:
  - 1 Start Bit
  - 8 Data Bits
  - 1 Stop Bit
  - No Parity
- The data is sent asynchronously. The Data Set Ready (DSR) line is checked before sending a character.

APPENDIX B

# Q100 DOSIMETER

## Setup Software

Version 1.20
March 11, 1994

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# CHAPTER1

## INTRODUCTION

**OVERVIEW:**

Q100 Dosimeter Setup is a graphical program intended to work with the QUEST TECHNOLOGIES Dosimeter model Q100. The program operates in an IBM PC or compatible environment. Q100 Dosimeter Setup provides an easy mechanism to retrieve data from, or send data to a Dosimeter. Q100 Dosimeter Setup allows the user to configure a Q100 Dosimeter. Step by step instructions guide the user on installation and startup.

**SOFTWARE/HARDWARE REQ'D:**

**COMPUTER**:
Running the Q100 Dosimeter Setup software requires an IBM® or compatible personal computer with an EGA or VGA graphics monitor, DOS 3.31 or higher, 640K of RAM, and a 5.25 or 3.5 inch floppy disk drive. (For Windows only. Windows 3.0 or higher with at least 2MB of extended memory). The computer must also be equipped with at least one RS-232C (serial) communications port in order to interface with the Q100 Dosimter Setup.

A mouse, hard disk drive are recommended, but are not mandatory.

**Q100 Dosimeter Setup**:
Q100 Dosimeter Setup requires a Quest cable #056-956 or #056-707.

# CHAPTER 2
## COMPUTER OPERATION

**INSTALLING Q100 DOSIMETER SETUP** (On a Hard Disk):

If you have Q100 Dosimeter Setup on a 5 1/4 inch disk, your corresponding drive will probably be "A". If you ordered a 3 1/2 inch diskette *and* have 2 floppy drives, your corresponding drive will probably be "B". For example purposes, we will assume that your floppy disk drive will be "A".

1. Insert the Q100 Dosimeter Setup program disk into floppy drive **A**.

2. From the DOS environment (if in Windows, exit to DOS), type the following:

*A:INSTALQ1 A C* <Return/Enter>

where **A** is the source drive and **C** is the destination drive.

The installation program creates a directory named **DOSQ100** and copies the following files into that directory:

**DOSQ100S.EXE** - The MS-DOS executable.

**EGAVGA.BGI** - The graphics display driver.

**HELPQ100.DAT** - The help data file.

**Q100SETU.DAT** - Icons file.

**QSX**.@@@ - Serial number file.

**Q1SUCOMM.CFG** - Serial port setup.

**Q1SET.UP** - User parameters for Q100.

**INSTALQ1.BAT** - Installation batch file.

**CONNECTING THE DOSIMETER TO YOUR PC:**

You can connect the Dosimeter to your PC by merely connecting the end of the serial communications cable (with connector identical to microphone cable) to the DOSIMETER and connect the opposite end (Ribbon Cable Connector) to an available serial port on your computer. Execute Q100 Dosimeter Setup and proceed to Setup, Computer, Serial Port, to set the appropriate serial port and baud rate.

**EXECUTING Q100 DOSIMETER SETUP:**

Once you have installed the Q100 Dosimeter Setup software you can run the program.

1. Go to the directory which contains the Q100 Dosimeter Setup files. Type: ***CD C:\DOSQ100.***

2. Type: ***DOSQ100S*** <Return/Enter>(DOS version).

3. Should you experience problems running the program, see the section PROBLEMS AND WARRANTY.

# CHAPTER 3
## Q100 DOSIMETER SETUP OPERATION

**SCREEN CONTENTS:**

Q100 Dosimeter Setup's main window appears when you start the program. Here is where you open new windows to display or manipulate data. Q100 Dosimeter Setup has the following menu selections: "Setup", "Help", and "Exit". Each menu selection will be discussed in detail in the following sections. To select the first item using a mouse, click the left mouse button on the desired item. To select the first item from the main menu using the keyboard, use <Alt>+<underlined character>. To exit the current display window at any time, press <Alt>+<F4>. For further instructions on navigating the menus and windows, see "USING THE WINDOWS" section in this chapter.

**MISC DEFINITIONS:**

Below are some common definitions or techniques referred to in this manual that the user should understand.

**BAUD RATE:**
The baud rate determines the speed at which the DOSIMETER communicates with the computer.

**COM PORT:**
The DOSIMETER communicates with the computer via the RS-232C communications port in the back of the computer.

**<"KEY">+<"KEY">:**
When a plus sign appears between key names, it means that you must hold down the first key and then depress the second, as in <Alt> + <Esc>, for example.

**MOUSE OPERATIONS:**

**CLICK:**
Depress and release of a mouse button

**DRAG:**
Depress the left mouse button, and while still holding the button down, *"drag"*(move) the pointer across the screen to the desired position.

**DOUBLE CLICK:**
Depress and release a mouse button twice, in rapid succession.

**POINT:**

Move the mouse until the tip of the pointer rests on the desired item.

**POINTER:**

The small arrow on the screen which indicates the relative position of the mouse. The pointer will change to an hour glass while processing certain operations.

**SCROLL BAR:**

Some parts of the program use a scroll bar to ease viewing of the information on the screen. The scroll bar is located on the right side of the window with an up arrow at the top of the column and a down arrow at the bottom. Inside the column is a position box which indicates where the information viewed is located relative to the entire text. Using the key board, press <PG UP>, <PG DOWN>, or up/down arrow keys to scroll through the text. When using the mouse, click the left mouse button on the arrows in the scroll bar or drag the position box up or down.

## USING THE WINDOWS:

**MOVING THE WINDOW:**

Using the keyboard, press <Alt>+<F7>. This will highlight the window, indicating that it has been selected. Use the direction (arrow) keys to move the window and press <Return/Enter> to secure the window to the new location. When using the mouse, point to the window's title bar and click and hold the left mouse button. Drag the window to your desired location. Release the mouse button to secure the window in a new location.

**SIZING THE WINDOW**:

**MINIMIZE (windows only):**

Either press <Alt>+<F9> or click on the minimize box using the left mouse button. Repeat to toggle back to the original state.

**MAXIMIZE (windows only):**

Either press <Alt>+<F10> or click on the maximize box using the left mouse button. Repeat to toggle back to the original state.

**ANY SIZE:**

Using the keyboard, press <Alt>+<F8>. Then use the Direction keys to move the lower right corner of the window to the new location. Press <Return/Enter> to size the window.

Using the mouse, point to a window border (either an edge or a corner - double direction arrows will appear). Click the left mouse button and drag the border to a new location, then release the mouse button.

**MOVING BETWEEN WINDOWS:**
To move back and forth between windows, press <Alt>+<F6> or click the left mouse button on some exposed portion of the desired window.

**GETTING AROUND WITHIN A WINDOW OR MENU:**

If you are using a mouse, point to the object you wish to select. To cancel a menu selection, use the mouse to move the arrow to a blank area outside the menu area and click the left button. If you are not using a mouse, the following are suggestions to manipulate and select items within the window or menu.

1. When the window you are using has a vertical (pull down) or horizontal (toolbar) lists of choices, typing the underlined letter will initiate that selection for you. A common example found in almost all window oriented programs is the File function. Typing "F" is the equivalent of selecting "File" with the mouse. For toolbar menus, <Alt>+<underlined letter> must be used to go to the selection the first time. <ESC> is used to return to the attached window. Use the arrow keys to move to the other selections and press <Return/Enter> to initiate the selection. <ESC> will remove the current pull down menu if one exists. Also, up and down arrow will display any pull down menu items for a highlighted toolbar selection.

2. Whenever you are moving to "buttons" such as Get, Save, Send, Close, OK, Cancel, Done, etc. or need to move around to different groups (multiple fields in a sub window of the current window) or fields (not in a group) within the window, use the <Tab> key. Whenever the button (or field) is highlighted, <Return/Enter> will activate that command (or for input fields enter data appropriately). Using the up, down, left and right arrows will move you around to different selections within a group. Additionally, buttons may be executed by choosing <Alt>+<underlined letter>.

As an example, return to the main menu by hitting <Alt>+<F4>. This can be considered to be a group. Since this is the only group available, using the <TAB> key will have no effect. Use the left/right arrow keys or underlined letters to maneuver around the different selections. You can use up/down arrow keys, and then using the up/down or right/left arrow key, see what's under the main selections. If the selection has a black filled arrow prompt on the right, that means that this item, when selected, brings up a sub-menu.

**CLOSING A WINDOW:**
To close a window, press <Alt>+<F4>. If the window provides it, use the mouse to select the "system" box, then "Close" or select the select the appropriate button (Cancel, Close, Done) using the left mouse button or <Alt>+<underlined letter>. The system box is on the far left corner of the title bar.

# CHAPTER 4
## DETAILED Q100 DOSIMETER SETUP SCREENS

**S**etup

The Setup menu selection will bring up two options allowing you to setup a Dosimeter or the Computer.

### Dosimeter:

Within the Dosimeter menu, there are 5 subfunctions: Parameters, Date/Time, Auto-On, Security and Print Options.

**Parameters:**

The following parameters are user selectable:

| Parameters | Range |
|---|---|
| Threshold 1 | 40 to 140 dB |
| Threshold 2 | 40 to 140 dB |
| Exchange Rate | 3 to 6 dB |
| Upper Limit | 40 to 140 dB |
| Response | Slow or Fast |
| Weighting | A or C |
| Criterion Level | 40 to 140 dB |
| Projected Time | 1 to 18hrs(steps = 0.25hrs) |
| Dosimeters Logged | 1 or 2 |
| Log Avg | YES or NO |
| Log Max | YES or NO |
| Log Peak | YES or NO |
| Logging Interval | 1 Sec/10 Sec/1 Min |
| Calibration | 90.0 to 125.0 dB |
| Measuring Range | 40 to 110dB / 70 to 140dB |

NOTE! Measuring Range has no affect when used with a Q100 dosimeter prior to version 2.00.

You may Save the current Parameter Settings to a User Parameters file, Get parameters from a dosimeter, or Send the current parameters to dosimeter. Saved User Parameters may be retrieved from a Saved file by selecting the User Parameter name in the User Parameter pull down menu.

**Date/Time:**

This allows you to Get the current date and time from a dosimeter or Send a new date and time to a dosimeter. Also, you may set the dosimeter Date and Time formats to "Month-Day-Year" or "Day-Month-Year" and "12 Hour or 24 Hour" respectively.

Use the <Tab> key to move from group to group or to a button.
Use the left, right, up and down arrow keys to move within a group.
Use the up and down arrow keys to change the month field.

**Auto-On:**

Enables you to set the parameters used in the Auto-On function. The Dosimeter can be programmed to turn on for a date event, a daily event, or events that occur on any day of the week you wish. Toggle the desired selection, noting the effect in the fields on the right marked "Time", "Weekdays" and "Date". Be sure to enter values into all fields.

The "Get" button will obtain the current settings in a dosimeter with the Auto-On Enabled field indicating whether the function is enabled or disabled. To activate the function, select "YES". To deactivate, select the "NO" and Send the selections to a dosimeter. As a good practice, select the "Get" button for verification.

**Security:**

The Security function allows you to "Lock-Out" another person's access to a Dosimeter if that person does not know the security code. The dosimeters security code is programmable with the computer. Also, the Auto-On function in a dosimeter may be automatically secured from the computer.

**Secure Code:**

This function allows you to change a 4-digit security code in a dosimeter after you successfully enter the password for the PC.

A window will appear prompting you for the password for the PC. Once the password is entered and you select "OK", the password is verified and the program proceeds.

The screen prompts you for a new 4-digit security code followed by two spaces. Once the new code is entered, the user " Sends" the security code to a dosimeter.

A "Get" may be used to retrieve a dosimeters serial number and security code. As a good practice, the user may want to verify the security code setting.

**Secure:**
This function allows you to have the choice of enabling **"Secure Option"**, along with **"Secure Auto-On"**. "Secure Option" will allow the user to scroll the Q100 dosimeter menu items to a selection which will secure the Q100. To secure the Q100 away from the PC, rotate the display using the arrow keys until "SEC" appears. Then put the dosimeter into the "RUN" mode. If auto-on was secured, the unit will automatically power down (see Q100 operation manual). For the Q100, the Auto-On function will be secured if Auto-On was previously enabled.

**Print Options:**
The Print Options function allows various printer options to be selected, specific to a dosimeter:

All:
Prints all the data for each of the available options including all events and all logged data at the logging interval in which the data was logged (e.g. 1 Sample/Line). The page breaks and tabular/graphical selections must also be specified.

Selected:
Prints only the options selected by the user. The page breaks, samples/line and tabular/graphical selections must also be specified.

Header:
Prints the blank header from the dosimeter.

Calibration:
Prints the calibration history for the dosimeter.

Dosimeter 1:
Adds the printing of the information for dosimeter 1. Parameters, Summary, Statistics, LN Levels, Events, Time History Averages and Maximums are printed for dosimeter 1 when selected and available.

Dosimeter 2:
Adds the printing of the information for dosimeter 2. Parameters, Summary, Statistics, LN Levels, Events, Time History Averages and Maximums are printed for dosimeter 2 when selected and available.

Parameters:
Adds the settings used during the collection of the data for each of the selected dosimeters to the output.

Summary:
Adds the data summary for the overall time the dosimeter was run. The information which is provided may include the dosimeter settings, Peak, Max and Min levels with date/time stamps, Upper Limit time, Lavg or Leq (3dB exchange rate and 40 dB threshold), Dose, Projected Eight Hour Dose (Dose[8.00]), Projected Dose (Dose[Projected Time]), Time Weighted Average (TWA), Projected Time Weighted Average (TWA[Projected Time]), Sound Exposure Level for the dosimeters exchange rate (SEL(exchange rate)), Level Day/Night (Ldn) only on dosimeter 1 overall summary; if the dosimeter was performing this function the user will have the value displayed, otherwise, "OFF" is displayed, Exposure

(Expo) (3dB exchange rate).

Summary Peak:
Adds the Peak level and date/time stamp to each selected dosimeter summary output.

Summary Upper Limit:
Adds the amount of time above the Upper Limit to each selected dosimeter summary output.

Statistics:
Prints the % Time Statistical Distribution for each of the selected dosimeters.

LN Levels:
Prints the Exceedance Level table for each of the selected dosimeters.

Events:
Prints the information for all events in the dosimeter. The information may include the headers and summaries for each selected dosimeter.

Averages:
Prints the Time History of the logged averages data for each selected dosimeter. The data is printed in either graphical or tabular form with Samples/Line combined into each of the output numbers.

Maximums:
Prints the Time History of the logged maximums data for each selected dosimeter. The data is printed in either graphical or tabular form with Samples/Line combined into each of the output numbers. Q100 only contain maximums for dosimeter 1.

Peaks:
Prints the Time History of the logged peak data. The data is printed in either graphical or tabular form with Sample/Line combined into each of the output numbers.

Page Breaks:
Adds page breaks into the reports of the events and time histories.

Tabular:
Prints all selected Time Histories in a tabular format. Five consecutive output numbers are combined on each output line.

Graphical:
Prints all selected Time Histories in a graphical format. Each line contains one number output followed by the graphical representation of the number.

Samples/Line:
Prints all selected Time Histories in graphical or tabular form with the specified number of samples to combine for each number in the output. The range of values is 1 to 120.

Print Header Title:
Prints a user specified name in place of the Quest Technologies name at the beginning of the printout. The user may enter up to a 72 character name.

NOTE! A message may appear when retrieving a dosimeters print option settings. This message can be ignored if all communications appear to be correct and the version numbers for the dosimeters are lower than 1.24 for the Q100.

**Computer:**

Within the Computer menu, there are two subfunctions: Serial Port and Password Change.

**Serial Port:**

This allows you to set the baud rate and port of the computer being used. It is suggested to use 9600 Baud. The Baud of your PC must match that of the Dosimeter being read. (Note[1], the Q100 only allows 9600 baud). (Note[2], remember that using (Com 1 and Com 3) or (Com 2 and Com 4) simultaneously is prohibited!)

**Password Change:**

This allows the user to change the Password for the PC so that the user must know the password to allow dosimeter security code changes.

## Help

The help menu supports the following topics:

**Keyboard:**
The Keyboard function displays help on how to use the keyboard to interact with the program. Shortcut key sequences are discussed.

**Mouse:**
The Mouse function displays help on how to use the mouse to interact with the program. Mouse shortcuts are discussed.

**Setup Commands:**
The Setup Commands function displays help on all the functions which can be performed in the "Setup" section of the program. Also mentioned are special notes to guide the user to avoid problems with the execution of the program.

**General Commands:**
The General Commands function displays help on general activities performed while executing the program. Such items as window commands are included.

**Procedures:**
The Procedures function displays help on specific procedures used within the program.

**Using Help:**
The Using Help function displays information that describes how the help system works and how to interact with it during the execution of the program.

**About...**:
The About function displays information on the specifics of the program (e.g. the program name, version, serial number and copyright information).

The help screens all function in the same manner. By selecting the Help option from the main menu and then the topic, an information screen will appear. Move the position box in the scroll bar to advance the screen (or use the arrow or page up/down keys). Select <F3> to close any help window.

# Exit

The user may exit the program or continue.

# CHAPTER 5
## PROBLEMS AND WARRANTY

**Communication Problems:**
If you are having problems getting your dosimeter to work with your PC, check the following:

1. Make sure the baud rate set on the unit matches the baud rate you selected in the Computer Serial Port Setup Window. Refer to the dosimeter user's manual for setting the baud rate on the unit if applicable.

2. Check to be sure you set up the COM port according to the suggestion outlined in the Setup section of this manual.

3. Check your serial communications cable It must be a Quest Technologies serial cable #056-956 and it must be turned on.

4. Check the cable connections for a proper and secure fit.

5. Is your battery LOW? A low battery will cause unpredictable serial communication errors. Use an AC to DC converter when ever possible.

6. Verify the dosimeter status is correct. The Q100 should display "Ser".

7. Check to make sure the unit has not locked up. Press the ON/OFF button on the unit for a few seconds. The display should start counting down. If it doesn't, the unit is locked up. If the unit is locked up, disconnect the power and try again.

**Running Problems:**

1. Check the amount of memory available to run this application. Typically 400K+ is needed. If insufficient memory exists, you will need to move/remove some of the Terminate and Stay Resident (TSR) programs currently resident in memory. Consult your DOS manual for details on what needs to be done.

**WARRANTY:**

LIMITED WARRANTY.
Quest Technologies guarantees that the software will perform in accordance with the accompanying manual for 90 days after the date of shipment to original customer.

There are no other warranties, either express or implied, with respect to the software and the accompanying manual. Quest Technologies liability shall in no event exceed the price paid to Quest Technologies for the software and manual.

Products must be returned properly packaged with transportation charges prepaid to Quest Technologies. You must specify the defect which you claim in writing and include it with the material which is returned.

# Service Policy

The Quest product you have purchased is one of the finest acoustic instruments available. It is backed by our full one year warranty which seeks complete customer satisfaction. This is your assurance that you can expect prompt courteous service for your equipment from the entire Quest service organization.

Should your Quest equipment need to be returned for repair or recalibra-tion, please contact the Service Department at (800)245-0779 (USA) or Fax (262)567-4047 for a Return Authorization Number. The RA number is valid for 30 days, and must be shown on the shipping label and purchase order/cover letter. If you are unable to return instruments in that time call for a new RA number. Send it prepaid and properly packed in the original shipping carton directly to Quest Technologies, 1060 Corporate Center Drive, Oconomowoc, WI 53066 U.S.A.

Repair or replacement work done under warranty will be performed free of charge, and the instrument will be returned to you prepaid. Your copy or a photocopy of the Quest Registration Card will serve as proof of warranty should the factory require this information.

If for any reason you should find it necessary to contact the factory regarding service or shipping damage, please direct your calls or letters to the attention of the Service Manager, Quest Technologies, (262) 567-9157 or (800) 245-0779. Office hours are from 7 AM to 6 PM (Central Standard Time) Monday through Friday.

For service or recalibration outside the U.S.A., please contact your local Quest Dealer or fax Quest U.S.A. at (262)567-4047.